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ABSTRACT

The purpose of this study was to follow up teacher graduates of a preservice field-based program after one to five years of teaching. Field-based activities in the program involve actual teaching for a period ranging from one to five quarters, organized at different levels--elementary, junior high, and senior high schools, and in different settings--urban and suburban. The sample was composed of 86 graduates employed as full-time science teachers in Ohio during 1974-75. Preservice data included each subject's score on Science Classroom Activity Checklist: Teacher's Perception (SCACL: TP), grade point average (preprofessional, professional, and cumulative). Inservice scores were collected by administering instruments to the teachers, their students, and administrators. Data analysis showed no significant difference in changes of teachers' views regarding the appropriate type of classroom activities. No significant differences were found in the type of activities implemented by teachers with one to five years of teaching experience. Administrators' views regarding science teaching and support given to science teachers was a strong independent predictor variable. It appeared that the views of the graduates toward inquiry-oriented teaching and the use of such activities in the classroom remained stable five years after graduation. (Author)

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A FOLLOW-UP STUDY FOR EVALUATION OF THE PRESERVICE SECONDARY SCIENCE TEACHER EDUCATION PROGRAM AT THE OHIO STATE UNIVERSITY

Piyush Swami

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A FOLLOW-UP STUDY FOR EVALUATION OF THE PRESERVICE SECONDARY SCIENCE TEACHER EDUCATION PROGRAM AT THE OHIO STATE UNIVERSITY

By

Piyush Swami, Ph.D.

The Ohio State University, 1975

Professor Stanley L. Helgeson, Adviser

The purpose of the study was to follow up teacher graduates after one to five years of training in a preservice field-based program. One of the main purposes of the program was to prepare science teachers who implement inquiry-oriented activities in their classrooms. Field-based activities in preservice programs involving actual teaching and other related experiences ranged from one quarter to five quarters in length. The preservice experiences were organized at different levels -- elementary, junior high, and senior high schools, and in different settings -- urban and suburban.

Some of the major questions investigated were the study of the changes in teachers' views, after preservice training, regarding the appropriateness of inquiry-oriented activities in science classrooms, and the study of activities implemented by teachers with different lengths of teaching experience. A large

number of independent variables concerning characteristics of teachers, students, school administrators, and school settings were examined to discern some strong predictor variables.

The sample was formed of 86 former graduates with full-time science teaching positions in the state of Ohio during the 1974-75 school session. This number amounted to almost 80 percent of all the graduates still teaching in the state. Data analyses on certain preservice variables (for example, grade point average and similar variables) for sample teachers and the rest of the graduates did not reveal any significant differences within separate years of graduation.

The inservice data were collected during the spring of 1975 from teachers, students in a single class taught by each of the sample teachers, and science supervisors or school administrators. The instruments used were: *Science Classroom Activity Checklist: Teacher's Perceptions* (SCACL:TP), *Checklist for Assessment of Science Teachers: Supervisor's Perceptions* (CAST:SP), *Checklist for Assessment of Science Teachers: Pupil Perceptions* (CAST:PP), *Teacher's Questionnaire* (T.Q.,), *Student's Questionnaire* (S.Q.), *Administrator's Questionnaire* (A.Q.),and *Facilities Checklist* (F.C.). In addition, preservice scores on SCACL:TP were obtained for each sample teacher from the old college records to determine changes in the views of teachers since the completion of their preservice program.

Results of the analysis of variance showed no significant differences in changes of science teachers' views regarding the appropriate types of classroom activities after one to four years of teaching experience. No significant differences were found in the types of activities actually implemented in classrooms by teachers with one to five years of teaching experience.

The statistical analysis of data on 121 independent variables by step-wise regression and factor analysis revealed certain variables which are strong predictors of teachers' views on, and actual implementation of, appropriate types of activities in classrooms.

Teacher related variables included exposure to and attendance at workshops related to newly developed inquiry-oriented curriculum materials, feeling toward class facilities, diversity in use of instructional techniques, teacher pupil relationships, a teacher's personal adjustment and sex (to favor females). Student related variables included liking for science course, last final grade in science, and liking for assignments.

Administrator variables found to be strong predictors included administrators' views on dealing with adolescents, diversity of instructional strategies, type of encouragement and help given teachers in the use of variety and balance in instructional techniques. Situational variables included presence of basic laboratory equipment, physical facilities, laboratory assistants, fewer periods for teaching per day, modified class, and use of newly developed curriculum materials.

An important finding of this study was that students generally liked inquiry-oriented teaching. Administrative support for inquiry-oriented activities was considered essential for their use by teachers.

In conclusion, an outcome of field-based programs such as the one studied is the stability of the views of teachers and their continued utilization of inquiry-oriented activities in science classrooms five years after completion of preservice training.

A FOLLOW-UP STUDY FOR EVALUATION OF THE PRESERVICE SECONDARY SCIENCE TEACHER EDUCATION PROGRAM AT THE OHIO STATE UNIVERSITY

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Piyush Swami, B.S., B.Ed., M.Ed., M.S.

* * * * *

The Ohio State University
1975

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TABLE OF CONTENTS

Page

ACKNOWLEDGMENTS ii

VITA iii

LIST OF TABLES v

Chapter

I. INTRODUCTION 1

Teacher Education Program for Secondary School Science Teachers at the Ohio State University 3
Statement of Problem 7
Hypotheses 7
Variables Studied 9
  Criterion Variables 9
  Student Characteristics 10
  Teacher Characteristics 10
  Situation Variables 11
  Administrative Variables 11
Importance of the Study 11
Definition of Terms 14
Procedure 15
  Population and Sample 15
  Sources of Data. 16
  Teacher Data 16
  Student Data 17
  Administrator Data 18
  Administration of Instruments 19
  Analyses of the Data 19
Assumptions 20
Limitations 21
Delimitations 21

TABLE OF CONTENTS (Continued)

Page

Chapter

II. REVIEW OF THE LITERATURE 23

Selected Independent Variables in Teacher Education 23
Teacher Related Variables 24
1. Background, Age, Sex, and Experience . . 24
2. Experience with Different Curriculum Materials 31
3. Teacher-Pupil Relationships and Teacher's Personal Adjustment 35
Student Related Variables 39
Administration Related Variables 42
Situational Variables 44
Summary of Selected Independent Variables . . . 47
Follow-Up Studies of Teacher Education Programs 48
Research on the Field-Based Preservice Secondary Science Teacher Education Program at The Ohio State University 64
Summary 72

III. THE STUDY -- DESIGN AND METHOD 75

Population and Sampling 75
Comparisons Between Participating Versus Non-Participating Population 79
Sex, Age, and Marital Status 85
Placements 86
Preparation 86
Teaching Load 87
Size and Type of Class 89
Procedures for Data Collection 90
Distribution of Materials 90
Scoring 92
Other Data 93
Selected Instruments 93
Checklist for Assessment of Science Teachers (CAST) 94
Science Classroom Activity Checklist: Teacher's Perceptions 102
Facilities Checklist 104
Administrator's Questionnaire 105
Teacher Questionnaire 106
Student Questionnaire 107

TABLE OF CONTENTS (Continued)

Page

Chapter

IV. THE RESULTS 108

Change in Views of Science Teachers Regarding Appropriate Science Classroom Activities 110
Determination of Type of Classroom Activities Implemented 120
Identification of Predictor Variables 135
  Multiple Regression by Using Independent Variables 136
    1. CAST:PP-B as Criterion Variable 138
    2. CAST:PP (Composite) as Criterion Variable 142
    3. CAST:SP-B as Criterion Variable 144
    4. CAST:SP (Composite) as Criterion Variable 148
    5. SCACL:TP as Criterion Variable 150
    Summary of Stepwise Multiple Regression . . 153
  Factor Analysis 156
    Factor 1 159
    Factor 2 163
    Factor 3 167
    Factor 4 170
    Factor 5 174
    Factor 6 178
    Factor 7 182
    Factor 8 186
    Factor 9 186
  Summary of Regression Analysis and Factor Analysis 189
Interpretation of Written and Oral Comments . . . 192

V. SUMMARY, DISCUSSION AND RECOMMENDATIONS 195

Discussion 205
Recommendations 212
  Program 212
  Schools 213
  General 214
  Further Research 214

BIBLIOGRAPHY 215

TABLE OF CONTENTS (Continued)

Page

APPENDIX

A 228

B 230

C 246

D 279

E 288

F 314

G 319

H 351

I 359

LIST OF TABLES

Table | Page

1 Number of Total Graduates, Graduates Teaching in Ohio in 1973-74 and Participating Graduates . . 78

2 Means and Standard Deviations on Selected Variables for Participating and Non-Participating Graduates 81

3 Tests of Significance on Selected Variables for Participants Vs. Non-Participants 82

4 Tests of Significance on Selected Variables for Years of Graduation 83

5 Tests of Significance on Selected Variables for Interaction Between Participation Vs. Non-Participation and Years of Graduation 84

6 Age of Sample Teachers 85

7 Types of Schools Employing Sample Teachers 86

8 Types of Preservice Professional Education Program for Sample Teachers 87

9 Number of Teaching Periods 88

10 Number of Subjects Taught by Sample Teachers 89

11 Class Size for Sample Teachers 90

12 Ranges, Means and Reliabilities of Teacher-Pupil Relationship Ratings as Reported by Best (1970, p. 78) 98

13 Significant Correlations Between SCACL:TP (Urban Schools) and CAST as Reported by Brown (1972, pp. 117-118) 99

TABLES (Continued)

Table Page

14 Correlations of SCACL:TP With CAST:SP and CAST:PP 100

15 Hoyt's Reliability Estimates for CAST:SP 101

16 Hoyt's Reliability Estimates for CAST:PP 102

17 The Kuder-Richardson-20 and Kuder-Richardson-21 Reliability Estimates for the Science Classroom Activity Checklist (Teacher's Perceptions) from Different Sources 103

18 Means and Standard Deviations of SCACL:TP Preservice and Inservice Scores According to Length of Teaching Experience 111

19 Means and Standard Deviations of SCACL:TP Preservice and Inservice Scores According to Types of Schools 112

20 Means and Standard Deviations on SCACL:TP Preservice and Inservice Scores According to Versions of Preservice Programs 113

21 Analysis of Variance on Changes in Preservice to Inservice SCACL:TP Scores According to Different Groups 116

22 Means and Standard Deviations on the Type of Classroom Activities Assessed by CAST:SP-B and CAST:PP-B According to Lengths of Teaching Experience 122

23 Means and Standard Deviations on the Type of Classroom Activities Assessed by CAST:SP-B and CAST:PP-B According to Type of Schools 123

24 Means and Standard Deviations on the Type of Classroom Activities Assessed by CAST:SP-B and CAST:PP-B According to Field of Specialization 124

TABLES (Continued)

Table Page

25 Means and Standard Deviations on the Type of Classroom Activities Assessed by CAST:SP-B and CAST:PP-B According to Preservice Program Versions 125

26 Analysis of Variance on CAST:SP-B and CAST:PP-B According to Length of Teaching Experience 126

27 Analysis of Variance on CAST:SP-B and CAST:PP-B According to Types of Schools of Employment . . . 128

28 Analysis of Variance on CAST:SP-B and CAST:PP-B According to Major Field of Specialization . . . 130

29 Analysis of Variance on CAST:SP-B and CAST:PP-B According to Versions Preservice Program 132

30 Regression Analysis: CAST:PP-B as Criterion Variable (All Independent Variables) 140

31 Regression Analysis: CAST:PP-B as Criterion Variable (Other CAST Scores Excluded) 141

32 Regression Analysis: CAST:PP (Composite) as Criterion Variable (Other CAST Scores Excluded) 143

33 Regression Analysis: CAST:SP-B as Criterion Variable (All Independent Variables) 146

34 Regression Analysis: CAST:SP-B as Criterion Variable (Other CAST Scores Excluded) 147

35 Regression Analysis: CAST:SP (Composite) as Criterion Variable (Other CAST Scores Excluded) 149

36 Regression Analysis: SCACL:TP as Criterion Variable (All Independent Variables) 151

37 Regression Analysis: SCACL:TP as Criterion Variable (All CAST Scores Excluded) 152

TABLES (Continued)

Table		Page
38	Eigen Values and Cumulative Proportions of Total Variance for All Independent Variables	158
39	Tentative Names of Independent Variables Factors	159
40	Factor 1. Maturity of Students	161
41	Factor 2. Administrator Teacher Interaction	164
42	Factor 3. Diversity of Instructional Techniques	168
43	Factor 4. Classroom Climate	171
44	Factor 5. Teacher's Feelings Towards Facilities and Materials	175
45	Factor 6. Student's Attitude Toward Science Teacher	179
46	Factor 7. Advanced Science Career Interest Influence	183
47	Factor 8. Professional Development	187

CHAPTER I

INTRODUCTION

The quality of education in schools hinges primarily on the quality of teachers. High levels of professional competence of teachers are crucial for the successful dissemination of human knowledge from one generation to the next. The teaching of science in this modern age, as is the case in many other fields, is more than the diffusion of cognitive knowledge. It involves also the affective and psychomotor development of learners. The significance of the task for science teachers can be determined easily by the magnitude of the application of scientific training in everyone's daily life.

A careful study of the task of the preparation of science teachers in colleges and universities must be given a high priority to ensure the success of such an educational enterprise. It is through constant and regular evaluation and reevaluation that science teachers will be able to receive an education that will enable them to fulfill the expectations of a changing society.

The problems associated with the evaluation of teacher education programs are difficult to solve, as is characteristic of the social sciences in general. A lack of complete understanding about teaching and learning behavior presents an obstacle in the development and implementation of a teacher education program that offers considerable certainty in the preparation of effective teachers. The subjective aspects of a teacher's personality and their relationship to student learning remain relatively unknown areas in educational research and, consequently, in developing a curriculum scheme for strengthening teacher education. Qualitative judgments are plentiful about what makes a "good" teacher, yet they lend little objective support for organizing a systematic program. Maucker (1969) notes:

> We are quite content to rely on status measures which reflect both selection and training, seldom do we seek to isolate achievement which may legitimately be considered the result of specific educational experiences under our direction, rather than the result of previous learning or general maturity. (p. 72)

The National Council for the Accreditation of Teacher Education has clearly stated in its Standard 5.1 (1970) that "the institution conducts a well-defined plan for evaluating the teachers it prepares." (p. 12) In a published report Brottman (1972) presents the results of a survey of the programs of 95 of the most innovative member institutions of the American Association of Colleges for Teacher Education. Of these only 30 institutions based their programs on some type of job analysis. The remaining institutions were guided by tradition or the experience of other institutions. This suggests a need for more institutions to develop their programs to meet the changing demands of the teaching profession. A general lack of studies which were aimed at evaluation of the program was observed by Cyphert (1972) during the 1960's. An urgent need seems to exist for continual experimentation in teacher education and for gathering information on what contributes to the preparation of effective teachers.

Teacher Education Program For Secondary School Science Teachers at The Ohio State University

The Faculty of Science and Mathematics Education at The Ohio State University has developed a field-based preservice teacher education program for preparing secondary school science teachers. A detailed description of the program is presented in the Mission Statement, the Project Proposal, and in a counseling notebook, all prepared by and available from the Faculty of Science and Mathematics Education. Two other descriptions of this program are presented by Mayer (1974) and Brown (1973). In this section a brief description is included referring to the main features of the program pertinent to this study.

The teacher education program currently provides an extended school-based experience to undergraduate and post-degree students. The graduates during the 1969-70 school year participated in a two-quarter sequence (S_1, S_2) in their senior year. A new junior year component extending over three quarters (J_1, J_2, J_3) was added to the ongoing two-quarter senior year sequence.

During the transition years (1969-70, 1970-71, and 1971-72), several different plans for the professional education component were offered simultaneously. These ranged from a two-quarter school experience to five quarters. A complete switch-over to a five-quarter sequence for undergraduates was attained in the fall of 1972. The post-degree students (post Baccalaureate or Master's) returning for a degree in education spend at least three quarters in the schools during the program.

Preservice students are provided experiences each quarter in working with school students at various levels, in different settings, and in different capacities. During the junior year they work in junior high, elementary and senior high schools. The range of experiences includes tutoring students on a one-to-one basis, conducting instruction in small groups, and assisting the regular classroom teachers.

During the first quarter in the senior year sequence (S_1), these students are assigned to junior or senior high schools located in inner city and suburban areas. They are required to spend five half-days each week working with the regular teachers in the schools, during which time they conduct instruction independently as well as assist the regular teachers in other classes. The final quarter (S_2) is a regular student teaching quarter.

Coordinated with the experiences in schools are regular instructional classes and seminars on the university campus. Each student is required to complete a large number of individualized science laboratory activities designed to provide experience in the use of science processes. A listing of the courses and plan of the program followed by the students majoring in different areas is included in Appendix E.

Two modifications made to the original five-quarter sequence program are an alternate experience (S_x) and an Earth Science Research Quarter (ESRQ) or a Summer Field Experience (SFE). The S_x quarter option was offered first during the 1973-74 school year. These students, who were assessed to be well-prepared at the end of the junior program, were given a choice to do full-time student teaching during their first quarter of the Senior Project (S_1). The second quarter of the Senior Project was then spent in alternate types of institutions related to education. Examples of this include the Ohio Historical Museum, the Center of Science and Industry (a museum), and the Ohio Youth Commission schools. The alternate experience, since the first attempt, has, however, been changed to an additional optional experience to be completed in the third quarter of the Senior Project.

The ESRQ program provides field-oriented research experience to mainly earth science education majors and some interested biological science and comprehensive science majors. During the spring quarter of each year the faculty organizes on-campus sessions daily for a period of the first two to three weeks. The aim of these sessions is to develop and orient field research skills in the students. During the next five or six weeks each student selects an environment-related research problem and collects data in the field as well as completes other related aspects. The quarter concludes with a written and an oral report of the project for other members. Other features of this experience are the cooperation from several different departments on the campus and a full-time commitment by the students to their individual projects during the ESRQ.

An underlying philosophy of the program is that science should be taught in schools in a way that actively involves students in learning. An additional significant feature of the program is faculty contact with students over a period of about one and a half years. A concerted effort is made by the faculty through numerous conferences, seminars and classroom discussions to project and develop the philosophy of and techniques for inquiry-oriented instruction.

The general objectives of the program are summarized as follows:

1. To develop the students' ability to utilize science processes in investigations and to organize their instruction around these processes.
2. To develop an understanding of the interrelationships of the science disciplines.
3. To develop teaching skills, especially an ability to use investigative or inquiry-oriented techniques.

Statement of Problem

This study is concerned with the evaluation of the preservice teacher education program for secondary science teachers at The Ohio State University and how effective it is as evidenced by the performance of its science teacher graduates in implementing its objectives. Another dimension of the evaluation involves a follow-up of graduates from one to five years after their preservice education to investigate the sustaining quality of their preservice education at The Ohio State University -- whether the main objectives stressed in the preservice education period continue to be reflected in the teacher's performance in the classroom.

More specifically, the problem of this study is stated as follows: _to evaluate the effectiveness of the preservice secondary science teacher education program at The Ohio State University_.

Hypotheses

The following hypotheses are identified in relation to the problem:

Hypothesis 1. The secondary science teachers graduated from The Ohio State University have not significantly changed their views regarding appropriate types of science classroom activities during their teaching careers in schools.

Hypothesis 2. There is no significant difference in the types of science classroom activities used in the schools by program graduates with different amounts of full-time teaching experience.

Hypothesis 3. There is no significant difference in the types of science classroom activities used by program graduates employed in different types of schools.

Hypothesis 4. There is no significant difference in the types of science classroom activities used by graduates with different fields of their main instructional specialization.

Hypothesis 5. There is no significant difference in the types of science classroom activities used by graduates who received their education in different versions of the preservice teacher education program.

Hypothesis 6. The types of science classroom activities used by the program graduates in schools are not significantly related to student characteristics.

Hypothesis 7. The types of science classroom activities used by the program graduates in schools are not significantly related to teacher characteristics.

Hypothesis 8. The types of science classroom activities used by the program graduates in schools are not significantly related to situational variables present in their schools.

Hypothesis 9. The types of science classroom activities used by the program graduates in schools are not significantly related to the variables concerned with the administration in schools.

Variables Studied

A list of the variables measured in this study is given below. The instruments used for the collection of data on each variable is provided in parentheses. The abbreviations used to refer to the various instruments are identified as:

A.Q.	Administrator's Questionnaire
S.Q.	Student's Questionnaire
T.Q.	Teacher's Questionnaire
F.C.	Facilities Checklist
SCACL:TP	Science Classroom Activities Checklist: Teacher's Perceptions
CAST:SP	Checklist for Assessment of Science Teachers: Supervisor's Perceptions
CAST:PP	Checklist for Assessment of Science Teachers: Pupil's Perceptions

Criterion Variables

1. Teacher's views regarding appropriate classroom activities (SCACL:TP)

2. Type of science classroom activities actually implemented	(CAST:PP,CAST:SP)

Student Characteristics

1. Age	(S.Q.)
2. Sex	(S.Q.)
3. Number of years of science	(S.Q.)
4. Future plans for pursuing a science-related career	(S.Q.)
5. Previous grade in science	(S.Q.)
6. Attitude toward the present course	(S.Q.)
7. Attitude toward the teacher	(S.Q.)

Teacher Characteristics

1. Age	(T.Q.)
2. Sex	(T.Q.)
3. Teacher's personal adjustment	(T.Q.)
4. Teacher pupil relationship	(CAST:SP,CAST:PP)
5. Total teaching experience	(T.Q.)
6. Graduate degree	(T.Q.)
7. Acceptance of grading system	(T.Q.)
8. Liking of classroom facilities	(T.Q.)

Situation Variables

1. Physical facilities	(F.C.)
2. Equipment and supplies	(F.C.)
3. Number of students in class	(F.C.)
4. Level of the course	(T.Q.)
5. Textbook materials	(T.Q.)

Administrative Variables

1. Administrator's views toward science teaching	(A.Q.)
2. Administrator's views toward classroom discipline	(A.Q.)
3. Type of instructional guidance and encouragement	(A.Q.)
4. Administrator's views toward teacher's role in dealing with adolescents	(A.Q.)

Importance of the Study

Two separate college-wide follow-up studies (1974) were conducted at The Ohio State University with a sample selected from the graduates of the years 1971, 1972 and 1973. These studies included teacher education graduates from nearly 19 areas. The first study was conducted by the Educational Personnel Placement office. It involved sending a four-page questionnaire to 10 percent of the graduates. The return was only 44 percent.

The other study concentrated on gathering information on the problems of teachers in schools. The Teacher Problems Check List was developed and sent to graduates currently teaching in Ohio. The sample included 29 science teachers from a total of 200 science education graduates in the three years. The results of these studies are not completely analyzed and reported at the time of this writing.

The Faculty of Science and Mathematics Education has completed several studies to evaluate the effectiveness of the undergraduate science education program. These studies were conducted by Sagness (1970), Brewington (1971), Cignetti (1971), Brown (1972), and Lucy (1972).

Sagness (1970) reported that the preservice teachers involved in early school experience (Senior Project) in urban and suburban settings showed greater knowledge of culturally deprived students than did the candidates in the conventional program without early school experiences. Brown (1972) reported that the experiences in the Senior Project were responsible for the use of significantly more activities in classrooms by the participants than the preservice teachers in a traditional program.

In follow-up studies Brewington (1971) and Cignetti (1971) reported that the science teachers who were trained in the field-based program conducted more inquiry-oriented teaching activities than other comparable teachers' groups. Both investigators conducted their studies during the first year of full-time teaching assignments for the program graduates. The comparison groups were chosen from the graduates of the conventional programs of The Ohio State University and other universities.

Lucy (1972) reported that the laboratory activities which formed a part of the secondary science teacher education program resulted in the better understanding of the nature of science by the participants. A detailed description of these studies is included in the chapter on the review of the literature.

There is an ample amount of research evidence available (described in Chapter II) on the success of teacher education programs during student teaching or the first year of teaching. It should be of tremendous significance to evaluate the performance of teachers after a few years of teaching experience. The investigator considers that the evaluation of the performance of science teachers trained in a field-based teacher education program, as implemented at The Ohio State University, after one to five years of teaching experience, may provide significant information about the stability effects of such programs. Because of the work already completed by other investigators, Brown (1972), Sagness (1970), Brewington (1971), and Cignetti (1971), it should be of interest to enlarge and build upon the baseline data obtained from other studies.

Definition of Terms

1. Preservice teachers. This term applies to any secondary school science education student in the professional division of the College of Education at The Ohio State University.

2. Preservice education program. This is the teacher education program and its various versions for the preparation of secondary school science teachers and conducted by the Faculty of Science and Mathematics Education at The Ohio State University.

3. Inservice teacher. The term is applied to a full-time science teacher employed in a secondary school after certification requirements were completed at The Ohio State University.

4. Field-based teacher education program. The term designates a preservice program providing a greater variety of teaching and other experiences in schools of different settings. Such a program extends beyond one quarter of professional education.

5. Supervisor/Administrator. This term refers to a school principal, vice-principal or a designated department chairperson responsible for supervising the science teacher directly.

Procedure

Population and Sample

The population for the empirical phase of this study consisted of certified secondary science teachers who graduated from The Ohio State University (Faculty of Science and Mathematics Education) during the period 1969-70 through 1973-74. At least five different versions of preservice teacher education programs for secondary science teachers were implemented at some time during this period. One of the principal differences among these programs was the length of involvement of candidates with the schools in the Columbus area.

These programs were:

Senior Project -- two quarters, S_1, S_2, in schools

Junior and Senior Project -- five quarters, J_1, J_2, J_3, S_1, S_2, in schools

Alternate Experience -- five quarters, J_1, J_2, J_3, S_2, S_x

Program for earth science majors, ESRQ or SFE -- at least four quarters in schools and an additional quarter in field-based research experience

Post-Degree -- three quarters, PD_1, PD_2, PD_3, in schools

A sample of 94 teachers in the state of Ohio was selected from this population, representing each of the above-mentioned programs. The sample was formed on the basis of the approval received from the school administrators and the individual teachers for participation in the study. A total of 106 graduates were located as full-time science teachers in Ohio during the 1974-75 school year. The contacts were established with the school administrators and then with the teachers. The majority of them expressed a willingness to participate in the study. Negative responses were received from six teachers and two administrators (responsible for another six teachers).

Sources of Data

The data used in this study were obtained by using questionnaires, checklists, and through personal interviews. The paper and pencil type of instruments was completed by the teachers, the pupils, and the school administrators.

Teacher Data

The data collected from the teachers included their preservice and inservice data. A checklist was completed by the majority of the sample teachers during their preservice training. The same checklist was administered again in the spring of 1975. The information was obtained from the scores on this checklist about the teacher's perceptions of the appropriate type of classroom activities. Another checklist and a questionnaire were completed in the spring of 1975 regarding the science facilities available in the schools, and necessary biographical information.

These instruments were:

1. Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP) administered during the preservice training and the spring of 1975.
2. Facilities Checklist.
3. Teacher's Questionnaire.

The Science Classroom Activity Checklist: Teacher's Perceptions was developed by Sagness (1970) at The Ohio State University from a similar form used by Kochendorfer (1967).

Student Data

The students in a single science classroom taught by the sample teachers completed a checklist. The checklist was concerned with their perceptions of the type of activities used by the teachers and the teacher-pupil relationship.

A second instrument included a biographical questionnaire. These instruments were:

1. Checklist for Assessment of Science Teachers: Pupil's Perceptions (CAST:PP).
2. Student Questionnaire.

Administrator Data

The school principal, vice-principal or science department chairman completed a checklist and a questionnaire. The checklist was similar to the one used by the classroom students except for an additional aspect. The scores on the checklist were reflective of their perceptions regarding the type of classroom activities used, teacher pupil relationship, and the teacher's personal adjustment. The questionnaire provided the information on the administrator's views regarding science teaching, his role in providing instructional guidance and in dealing with adolescents.

These instruments were:

1. *Checklist for Assessment of Science Teachers: Supervisor's Perceptions* (CAST:SP).
2. *Administrator's Questionnaire*.

Both forms, the student's and the supervisor's, of the *Checklist for Assessment of Science Teachers*, were prepared by Brown (1972) at The Ohio State University. The two sub-sections relating to teacher-pupil relationship and the teacher's personal adjustment were taken from the rating scale developed by Leeds and Williamson (1956) and used by Howe (1964, p. 91).

The investigator visited each school to conduct short non-structured interviews with the administrators and teachers to discuss their impressions of the program and any special conditions for teaching science in their schools.

Administration of Instruments

The checklist (SCACL:TP) was administered by a faculty member during the preservice program. Of the sample teachers, 66 completed this checklist. However, there were another 28 sample teachers who either did not complete it or their scores were not available in the office files.

The other instruments for teachers and students were delivered by the investigator during his visits to 29 teachers in 27 schools. The materials were sent by mail to all other teachers. The administration of the instruments was limited to a four-week period from April 21, 1975, through May 16, 1975.

The materials for the administrators were delivered by the investigator during his visits to 18 schools. The others were sent by mail.

Approximately 50 teachers returned the completed instruments to the investigator during his visits to the schools. Others sent them by mail. The loss in the mail amounted to a total of four sets of data.

Analyses of the Data

Data from the various sources were transferred on unisort analysis cards. The techniques for the analyses of data included multivariate analysis, analysis of variance, stepwise multiple regression and factor analysis. Item analyses were performed on the three checklists by using FORTAP (RAVE) and STATPACK programs. The analyses were performed at the Baker Systems Engineering facilities of The Ohio State University.

Assumptions

1. The preservice scores obtained on Science Classroom Checklist: Teacher's Perceptions (SCACL:TP) are valid up to five years after administration for making comparisons.

2. The paper and pencil instruments measure the different constructs that they claim to measure.

3. The SCACL:TP and Checklist for Assessment of Science Teachers (CAST) assess the activities and practices which contribute to the positive implementation of contemporary objectives for science education as outlined in the secondary teacher education program at The Ohio State University.

4. The instruments are valid for use in the study regardless of geographic location, socio-economic level of the community, and the different types of science courses taught in schools.

Limitations

1. The instruments were administered by different teachers.

2. The experiences constituting the preservice programs included some unique as well as some common experiences for different sample teachers.

3. The results of this study can be generalized only to the extent that the sample and program characteristics resemble other populations and other programs.

Delimitations

1. The sample was formed from the full-time science teachers employed in the state of Ohio in the year 1974-75.

2. The administration of the instruments was completed within a period of four weeks. The actual time and the dates, however, were flexible for different sample schools.

3. Learning outcomes of students taught by sample teachers were not determined.

4. The selection of sample teachers was based primarily on their availability and willingness to participate.

5. The criterion variables (type of classroom activities) included in the study reflected only a part of the content stressed in the preservice program. Effects of other aspects, such as experience in two or more cultural settings, were not to be assessed.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter presents a review of the literature related to the following major areas:

1. Selected independent variables in teacher education.
2. Follow-up studies of teacher education programs.
3. Research related to the preservice program at The Ohio State University.

Selected Independent Variables in Teacher Education

Teaching-learning is a complex process. The participants in this process, a teacher and a learner, bring to a classroom their own personality characteristics, unique motivations, and expectations. It is easy to decide on rational statements about what a learner and a teacher should do in the classroom. It is exceedingly difficult, if not impossible, to block their unique personality characteristics from playing their role in it. In addition, availability of materials and physical facilities influence the performance of the teacher as well as the learner.

This section is devoted to the study of selected variables which are shown to be related to the teacher's effectiveness in the classroom. The list of variables discussed is selected on the basis of its direct relevance to this study. These are divided into four different variable categories related to teacher, student, administrator and situational characteristics.

Teacher Related Variables

A large number of teacher characteristics and their relationship to the teacher's effectiveness in the classroom is reviewed by Howe (1964), Balzer, Evans and Blosser (1973), and Peck and Tucker (1973). A few of the characteristics relevant to this study are included in the present review. The characteristics are divided into: Teacher's background, age, sex, and experience; teacher's experience with new curriculum materials; and teacher pupil relationships and teacher's personal adjustment.

1. Background, age, sex, and experience. One of the earliest attempts to investigate this topic was made in 1925 by Hughes and reported later (1971). His study was to determine if the preparation of physics teachers and the I.Q's of the students in each teacher's class were factors which condition the achievement of pupils. The sample included about 1,600 students and 30 physics teachers in 29 high schools. The students were tested for achievement in physics and the teachers were asked to provide information on their college training in physics and in education as well as on their teaching experience. As a part of this study 100 more physics teachers were studied for

their preparation in teaching physics and their teaching experience.

The researcher reported that when student achievement was studied in schools fairly comparable in all factors, except in the preparation of the teacher in college physics, higher achievement scores were obtained by those taught by college physics majors than non-physics majors. Student I.Q.'s were considered an important factor for achievement in physics. The scores of girls were significantly lower than those of boys on the achievement tests of Mechanics and Heat, and Electricity and Magnetism. Both groups were not significantly different on the tests on Light and Sound. Hughes made the statement, "As physics is now taught, a required subject for girls, which is the case in many schools, it seems unjustifiable." (p. 255)

Davis (1952, 1954) submitted a preliminary list of teacher factors to all members of the National Association for Research in Teaching, to a selected sample of the National Science Teachers Association, and to random samples of the American Association of School Administrators and the National Association of Secondary School Principals. These groups rated the factors included on the list. A final list of 17 factors was compiled from this. Some of the factors included were:

A. Other factors being equal, effective learning is more likely to occur when a teacher has a broad background of knowledge in the particular science he is teaching as well as in related areas.

B. Other factors being equal, effective learning is more likely to occur when the teacher has a functional knowledge of how children develop and how learning takes place.

C. Other factors being equal, effective learning is more likely to occur if the teacher knows about, understands, and uses a variety of methods of instruction as opposed to exclusive use of one or two methods.

D. Other factors being equal, learning will proceed more effectively when considerable attention is given to problem solving, development of critical thinking, and serious attitudes.

E. Other factors being equal, learning will proceed more effectively when the teacher has established a rapport with the learners and when the learners believe that the teacher is well-informed and effective.

Further, Davis (1952) studied the characteristics of the most effective science teachers. The following findings were reported:

A. Most science teachers rated as excellent were declared excellent in subject matter.

B. Competence in methodology appears to be closely related to competence in teaching.

C. Rapport with students is directly related to teaching effectiveness.

Anderson (1949) conducted a study in the biology and chemistry classrooms of 56 high schools in Minnesota during the 1946-47 school year. The students were administered Otis Mental Ability Tests and pre- and post-tests of state examinations in biology and chemistry. The data were gathered from the teachers by administering to them a test and a questionnaire to find out their understanding of the scientific method, their background, their teaching practices, and their teaching responsibilities. F tests were calculated, holding the I.Q. score and pre-test scores constant.

No significant differences in student achievement were found in classrooms taught by teachers with 46 or more hours of preparation in biology compared to teachers with 16 hours or less, teachers with six preparations compared to those with one or two preparations, or teachers with high or low scores on the scientific method test.

Student achievement was higher in biology in classes taught by teachers with 77 or more hours in all sciences compared to those with 32 hours or less, teachers with a Master's degree compared to those with no Master's degree, teachers providing for 60 or more hours of laboratory work per year compared to those receiving 12 or less hours laboratory work per year.

Butts and Raun (1969) studied the classroom practices of 19 elementary school teachers who participated in an inservice project on SAPA materials. They reported a significant correlation between teacher classroom behavior and knowledge in science. There were no significant correlations between classroom behavior measured by the Classroom Observation Rating (CORF) and credit hours of science, years of teaching experience, and grade level taught.

Morsh and Wilder (1954) reviewed the studies for the period 1900-1952 related to teacher effectiveness. They identified 20 predictors of effectiveness. Intelligence alone was found to be of little value as a predictor. The number of courses or credit hours completed was unimportant in discriminating between good and poor teachers. Considering age and experience, the teacher's rated effectiveness increased first rapidly as he gained experience and then more slowly up to five years. A levelling process set in with little change in performance for the next 15 to 20 years. Studies of the relative effectiveness of men and women or of married or unmarried teachers revealed no particular difference in effectiveness. The quality of the teacher's voice was not considered to be of much importance by administrators, teachers or students.

Rogers (1970) collected the data on the teacher's perceptions of students with the use of Perception of Pupils Objective Checklist. Classroom observations of these teachers were made with the use of the Flanders System of Interaction Analysis (FSIA). The analysis of data revealed that the classes found with more indirect behavior were taught by teachers with positive perceptions about students and vice versa. The age of the teacher and his having completed a recent science method course were not related significantly to verbal behavior in the classroom. Teachers from lower socioeconomic backgrounds tended to use authority more than teachers from higher socioeconomic backgrounds. The sample of this study included 76 fifth grade teachers from inner city and outer city schools.

Perkes (1967) correlated several teacher background variables with their classroom behavior. The data were gathered from school records and classroom observations of teaching with the Science Teaching Observation Instrument (STOI). The investigator concluded that the grade point average of teachers in science courses, recent enrollment in college science courses, and more credits in science methods courses were significantly related to student-centered teaching behavior. Positive correlations were reported from variables such as teacher talk, teacher conducted demonstrations, questions requiring recall of facts, student laboratory participation, questions of a hypothetical nature, and teacher-student discussions.

Bruce (1970) analyzed the questioning behavior of 33 elementary school teachers with the Teacher Question Inventory. The investigator found a significant negative relationship of high level questioning to the age of the teachers (-0.33) and their teaching experience (-0.41). A positive significant relationship was reported between age and recall of fact-type questions. No significant correlations were reported between the questioning behavior and scores on the Minnesota Teacher Attitude Inventory or the number of science credit hours.

Blosser (1970) investigated relationships of personality, sex, intelligence and education with the questioning behavior of 42 preservice secondary school science teachers. The investigator used the categories for questions explained in her publication, Handbook on Effective Questioning Techniques. The other data were obtained with the Otis Quick-Scoring Mental Ability Test, the Myers-Briggs Type Indicator, and the Educational Set Scale. There were no significant relationships reported between questioning ability and the independent variables.

Ost (1971) studied the effect of Summer Institute for Biology Teachers on the classroom activities used by the participants after the Institute. The findings reported were that the teacher's attitudes and the number of classroom activities changed significantly in a positive manner. Such changes were highest in teachers with less than three years' experience and for those who scored highest on the Dogmatism Scale. The instruments used were the Science Classroom Activity Checklist (SCACL), the Rigidity Flexibility Scale and the Blankenship Attitude Inventory.

Kleinman (1965) studied the critical thinking questions asked by junior high school science teachers and correlated them with the teacher's educational and experiental background. The correlations were not significant between the critical thinking questions asked and the teacher's background.

Ager (1968) reported significant relationships between various categories and indices of verbal behavior and several independent variables. The relationships reported included teachers' scores on the Minnesota Teacher Attitude Inventory, the American College Test Scores, the education grade point average, the Advanced Graduate Record Examination (Education). The sample for this study was 30 female elementary education student teachers. Classroom observations were categorized with the FSIA.

Howe (1964) reported that the composite success of biology teachers expressed in terms of the learning outcomes of their pupils is significantly related to total teaching experience, breadth and width of science preparation (over 60 quarter hours in biology), and salary above a certain limit.

2. Experience with different curriculum materials. Howe and Ramsey (1969), Ramsey and Howe (1969a, 1969b), reviewed studies which evaluated the impact of efforts made in training teachers to use newly developed curriculum materials. A representative sample of studies in this field is discussed in the present review.

Kochendorfer (1966) conducted a study to determine the differences in classroom behavior of biology teachers who had been trained in the use of BSCS materials and were using them for the first time. The comparisons were made between this group and the teachers using materials other than BSCS, and those who had been using BSCS materials for more than one year. A total of 64 teachers were included in the three groups. The investigator developed a Biology Classroom Activity Checklist (BCAC) and administered it to students. The analysis of the data showed significant differences in classroom activities among the three groups of teachers after the training in the use of BSCS materials.

Ost (1971) conducted a similar study to investigate the changes in teaching behaviors after attending a NSF Summer Institute for Biology Teachers. The instrument used was the Science Classroom Activity Checklist (SCACL) which was developed from BCAC. Pre- and post-measures showed changes in the teachers' classroom behavior in a manner consistent with BSCS rationale and philosophy.

Coffey (1968) and Ashley (1968) studied the changes in the behaviors of teachers trained in the use of Science - A Process Approach (SAPA) materials. Their results were indicative of the success of training programs. Coffey used the FSIA to observe classroom behavior in a pre- and post-test control group design. The experimental subjects used less teacher lecture, more teacher directions, allowed less student talk and an increase in silence or laboratory activity. Ashley observed the classroom behavior of 23 elementary teachers by Classroom Observation Rating Form

(CORF) and reported that teacher strategy had changed after the training in SAPA materials toward a more teacher directed lesson.

Moore (1968) compared the classroom behavior of teachers who participated in a PSSC inservice training program with those who had not received such training. By using an observational instrument based on sets of objectives for PSSC and non-PSSC curricular materials, he found very little difference in the PSSC teachers' classroom behavior.

In a similar investigation, Petit (1969) made use of different instruments for classroom observations. She reported a significant difference in classroom behavior in PSSC versus non-PSSC teachers. The differences were reported on the following: (1) asking questions or answering questions, (2) hypothesizing or generalizing, (3) leading class discussions, (4) allowing student discovery of relationships, and (5) posing questions at higher cognitive levels than non-PSSC teachers. The investigator suggested that the teacher's philosophy should be considered as a significant factor in the determination of classroom activities.

Crumb (1965) used 1275 high school students (physical science) from 29 rural and urban high schools in four different states. The selection of the school was mainly based on whether PSSC or a traditional program in physics was taught there. The data were collected three times during the year using the _Test on Understanding Science_ (TOUS). The statistical analysis was carried out by adjusting the pre-test scores, I.Q., and background in science. The results revealed that significant differences exist in the understanding of science between students studying PSSC and those studying the traditional courses.

Butler (1971) found with the use of FSIA and a question analysis system that the verbal behaviors of 10 teachers trained in the IPS program did not reflect the philosophy and goals of the program.

The classroom behavior of teachers using the ISCS materials was the topic for investigation for Vickery (1969). He used a three-dimensional science specific category system based on the FSIA for observations. The results were reported indicating more individualized and laboratory oriented activities in ISCS classrooms than classes using conventional materials.

The teachers trained and using ESS materials were the subjects for a study by Baker (1971). Two equal groups of randomly selected teachers were formed. The classroom behavior of ESS teachers and textbook oriented teachers were observed with the FSIA. The ESS teachers were reported more indirect in their verbal teaching, allowing a larger amount of student initiated talk.

Perkes (1971) worked with two groups of elementary school teachers both of which received instruction in a Science Education Methods course regarding the use of ESS materials. However, only the experimental subjects were allowed to select an ESS unit and teach it during the first-year teaching jobs. He reported that the experimental subjects were significantly different from the other group in terms of less talk, more verbal exchange with students and asking a large number of open questions.

Many other studies (Grobman, 1963, Lewis, 1966, Rainey, 1964, Troxel, 1968, Marie, 1961, Berger, 1964, Heath, 1964, and Schirner, 1968) were reviewed relating to the teacher's preparation in BSCS, CBA, CHEM Study, PSSC and ESCP materials. Howe and Ramsey (1969) concluded their review with a general statement:

> The background and philosophy of the teacher is important if a new course is being taught. Any given student will achieve more in a traditional course with a traditionally oriented teacher than he would have if the traditional teacher had taught a new course. Thus, *new courses can only be successful if the teacher is adequately prepared and philosophically oriented to teach the course*. (p. 58)

3. *Teacher-pupil relationships and teacher's personal adjustment*. Two factors which have been shown to relate to the teacher's effectiveness are teacher-pupil relationships and teacher's personal adjustment. Several investigators (Howe, 1964, Ryans, 1960, Williamson, 1956, Leeds and Cooke, 1947, Best, 1970, Brown, 1972, and Cogan, 1958) have used different instruments and approaches to study relationships between teacher and students. A representative sample of such studies will be reviewed here.

In an extensive project termed the Teacher Characteristics Study, Ryans (1960) and his associates studied the personal and social characteristics of more than 6,000 teachers in 1,700 schools and 450 school systems. The data from all the studies completed in this project were compiled and presented in a book entitled Characteristics of Teachers , first published in 1960. The criteria used for the selection of the participants in the study were the agreements of individual teachers and the school administrators to cooperate.

The data were gathered by observing teachers directly in the classrooms. An instrument, Classroom Observation Record (COR), was developed from the lists of significant teacher behavior patterns. The instrument included four dimensions of pupil behavior and 18 dimensions of teacher behavior. After compiling the observation data, reviewing previous studies and literature, three clusters (X_o, Y_o, Z_o) were identified for observable teacher behavior. These were:

Pattern X - warm, understanding, friendly vs. aloof, egocentric, restricted teacher behavior.

Pattern Y - responsible, businesslike, systematic vs. evading, unplanned, slip-shod teacher behavior.

Pattern Z - stimulating, imaginative, surgent or enthusiastic vs. dull, routine teacher behavior.

Besides the data collected from classroom observations, an inventory, Teacher Characteristics Schedule, was also used to get information from teachers relating mainly to personal preferences, self-judgments, frequently engaged-in activities, and biographical data. Large numbers of generalizations resulted from those studies. The "high" group of teachers was compared to the "low" group. The following concludions were reported for high or superior teachers:

A. They enjoyed pupil relationships (that is, more favorable pupil opinions).

B. They indicated greater preference for non-directive classroom procedures.

C. They are more satisfactory with regard to emotional adjustment. (p. 361)

Best (1970) concentrated on student-centered inquiry teaching in biology classrooms and the interrelationships of selected teacher characteristics to teaching methods and student outcomes. Data were collected from 33 teachers and their students. The instruments used were the Biology Activity Report, the Teacher-Pupil Relationship Scale, the Biology Teaching Inventory (student and teacher forms), the Index of Adjustment and Values, and the Views of Science Scale. The data revealed that students perceived teachers making about three times more decisions than students.

Howe (1964) determined the relationship of learning outcomes to selected teacher factors and teaching methods in tenth grade biology classes in the state of Oregon. A stratified random sample of 51 public high schools was selected, which provided 51 biology teachers and 1,191 students. Selected teacher factors and teaching methods were analyzed for relationships to five student learning outcomes:

(1) Gain in knowledge and understanding of biological facts, concepts, and principles;

(2) Gain in skill in applying the methods of science;

(3) Improvement in critical thinking skills;

(4) Development of an understanding of the nature of science; and

(5) Development of attitudes toward science and scientific careers.

Pre- and post-test scores were obtained on the *Nelson Biology Test*, the *Watson-Glaser Critical Thinking Appraisal*, the *Reaction Inventory, Attitudes toward Science and Scientific Careers and Science Teaching*, the *Teacher Inventory* and the *Teacher Rating Scale*.

The major conclusions of this study were that the teachers rated high in personal adjustment by principals were positively related to significant gain scores of students in knowledge, understanding of facts, concepts and principles, gain in critical thinking skills (.10 level of significance), development of attitudes toward science and scientific careers (at .10 level of significance). The teacher-pupil relationship factor was positively related to the development of attitudes toward science and scientific careers and the understanding of the nature of science. The teacher's attitude toward science and scientific careers was also positively related to the teacher's composite success.

Wilborn (1972) studied the relationship of teacher attitudes as measured by the _Minnesota Teacher Attitude Inventory_ (MTAI) and teacher ratings of children's behavior on the _Behavior Maturity Scale_ (BMS). The sample included 32 teachers and 745 pupils, divided equally into experimental and control groups. The findings were that MTAI total scores were not related to how the teacher viewed the behavior maturity of pupils. The conditions under which teachers work, as well as teacher attitudes, appear to affect a teacher's perceptions of pupil behavior.

Student Related Variables

The effect of student characteristics on the teacher's behavior and learning outcomes is considered an important factor (Khan and Weiss, 1973). This section reviews a few of the many studies examined in this particular field (Malpass, 1953, Brodie, 1964, Khan, 1970, Tenenbaum, 1944, Lahaderne, 1968, Glick, 1970, Gregersen and Travers, 1968, Goldberg, 1968, Morsh and Wilder, 1954, Dysart, 1953, Clothier and Lawson, 1969, Sandefur, 1969, Holmes, 1968, Sagness, 1970, Brewington, 1972, and Cignetti, 1972).

Morsh and Wilder (1954), after reviewing a large number of studies, concluded that student aptitude, ability and motivation, and cultural differences, among others, must be considered of significant importance in assessing teacher effectiveness.

The training in sociometry and sociodrama was utilized by teachers to understand the problems and behavior of students. Dysart (1953) assessed the teacher pupil rapport before and after the training. The direction of improvement was significantly positive.

Several studies, Gould (1974), Clothier and Lawson (1969), Sandefur (1969), Holmes (1968), have reported the effectiveness of preservice teachers increased considerably after an understanding of the pupils' environment and community was made possible. Trowbridge (1974) emphasized the need for actual live-in experiences in the homes of students to understand their problems and the general nature of the community expectations from the education of their students.

Holmes (1968) provided a community field experience designed to reduce the prejudices against Negroes of 76 preservice secondary teachers. The findings of an evaluation study included a significant reduction in the prejudices. Clothier and Lawson (1969) reported that 31 out of 40 teachers enrolled in a preservice program with opportunity for inner city experiences took jobs in urban schools after the completion of their training.

Irwin (1971) investigated the influence of students and the instructional task on teaching behavior patterns. Randomly assigned to one of the following groups were 88 preservice elementary science teachers who:

(1) Taught the same lesson to different pairs of children;

(2) Taught different lessons to the same pair of children; and

(3) Taught different science lessons to different pairs of children.

Audio tapes were made for the first and second science lessons. The data revealed that the preservice teachers were more similar than different on the pre- and post-teaching sessions.

In studies conducted regarding the secondary science teacher education program at The Ohio State University, Sagness (1970), and Cignotti and Brewington (1971) found significant correlations with student-related variables. Negative correlations were reported between classroom activity and the number of students in class and the environmental setting. For non-graduates from The Ohio State University no significant relationship was reported between classroom activity and students' attitude toward science.

Administration Related Variables

It is well-known that teachers in general, and science teachers in particular, need a lot of cooperation from their supervisors. Such cooperation extends to administrative matters such as scheduling a block of periods for laboratory activity, arranging transportation for a field trip or for general purchases for science equipment and supplies. Another facet of administrator-teacher cooperation is in the area of instructional leadership. A superintendent or principal, being directly responsible to the public, has a great interest in the type of instruction imparted in the classroom. Regularly scheduled observations and conferences with teachers are a part of this responsibility. Such responsibility combines both the instructional strategy and the content of instruction. Biology teachers have been questioned and guided by the community and legislatures to select certain instructional materials and strategies for the classroom.

The aspect of administrator and teacher relationship has been studied by many investigators (Sweat, 1963, Blumberg and Weber, 1968, Halpin and Crofts, 1962, Guba and Bidwell, 1957, and Getzels and Guba, 1957). A representative sample of studies with a bearing on this study is reviewed in the following discussion.

Halpin and Crofts (1962) developed a questionnaire, Organizational Climate Descriptive Questionnaire, which takes a situational approach to the issue. The questionnaire was developed through factor analysis using items which describe typical behavior of teachers and supervisors. There are eight sub-scores derived from it, four each for teacher and principal. The sub-scores for the teacher are disengagement, hindrance, esprit and intimacy. Sub-scores for the principal are aloofness, production emphasis, thrust and consideration. The pattern of scores on this questionnaire provides an index of climate openness from open to closed.

Getzels and Guba (1957) developed the Social Process Model to study leadership styles in a school. Three leadership styles were included in the model. These are nomothetic, that is, emphasis on requirements and conformity; idiographic, that is, stressing the needs and demands of the individual; and the transactional, that is, stressing the necessity for achieving goals as well as individual fulfillment.

Peruzzi (1972) used the Social Process Model and developed two instruments, the Science Supervisory Style Inventory, and the Science Teacher/Science Department Head Questionnaire. These questionnaires were administered to supervisors and teachers in 78 high schools in Massachusetts. The investigator reported that "science teachers indicate strong negative feelings toward nomothetic department heads and strong positive feelings toward idiographic department heads." (p. 316) The data also revealed that "congruence of expectations leads to mutual satisfaction." (p. 318)

Two factors concerning leadership from their supervisors which appeared significantly important for science teachers were approach to change and approach to classroom instructional help (Peruzzi, 1972).

In a national survey based on about 2,500 teachers' responses, Schlessinger et al. (1973) reported that 61.2 percent regarded administrative support as of high importance.

Situational Variables

Many investigators (Cartwright and Zander, 1953, Campbell et al., 1970, Tannenbaum and Schmidt, 1958, Cohen, 1972, Cronbach, 1957, Salomon, 1972, Gage, 1963, Altman, 1970, Roger, 1970, Payne, 1971, Wiegand, 1970, Engelhardt, 1968, Novak, 1972, Sagness, 1970, Brewington, 1971, Cignetti, 1971 and Schlessinger et al., 1973) have studied the problem of influence of situational variables in a school on teachers' performance. A representative sample of studies pertinent to this study is included in this review.

Altman (1970) investigated the classroom behavior of elementary science teachers in 13 university and 15 suburban elementary schools. The instrument developed for the observation was a self-developed observation system. The analysis revealed that elementary science teachers in advantaged classrooms used more verbal cognitive and less verbal procedural interactions than teachers in inner city schools.

Roger (1970) reported that students in 10 outer city elementary science classrooms initiated more talk and talked for longer periods of time than students in inner city science classrooms.

Wiegand (1970) measured the nature of a teacher's behavior in the classroom by using Withall's Social-Emotional Climate Index. The investigator reported that teachers who taught in middle class neighborhoods used a high frequency of supportive behaviors while teachers who taught in lower class neighborhoods used a high frequency of non-supportive behaviors.

Payne (1971) analyzed the classroom verbal interactions in Amish and non-Amish schools by using Flanders' revised i/d ratio. He reported that as the sampling moved from Amish to non-Amish classrooms, the teachers became more indirect in their behavior.

Schlessinger et al. (1973) reported three situational variables based on national survey data which were considered highly important by secondary science teachers for obtaining and maintaining a quality science program. These were a cooperative staff (57.3 percent),an innovative science curricula (55.0 percent), and adequate science facilities (71.8 percent).

Engelhardt (1968) investigated the relationship between characteristics of architectural space and science teaching methods in secondary schools. A teacher questionnaire coupled with an interview were completed by the investigator in 59 schools from five northeastern states. The investigator reported five factors which were significantly related to the science teaching method. These were provision of classroom laboratories, proximity of library, size of laboratory sinks, undeveloped outdoor areas, and individual laboratory space. The data supported that classroom laboratories are the most suitable facility.

Novak (1972) studied a logical connection between facilities and teaching methods employed. A major conclusion of this study was "that traditional, inflexible science facilities were accompanied by group-scheduled science programs." (p. 64)

Sagness (1970), Brewington (1972), and Cignetti (1972), in their evaluation studies on the preservice program at The Ohio State University found significant relationships of activities used in classrooms with the following:

A. Adequacy of laboratory facilities (positive).

B. Publication date of science textbook (positive).

C. Amount of laboratory work (positive).

D. Teacher's view of the importance of salary (negative).

Summary of Selected Independent Variables

1. Teacher's sex and age are not related to a teacher's effectiveness.

2. Length of teaching experience is negatively related to teacher's effectiveness.

3. Teacher-pupil relationships and teacher's personal adjustment are strongly related to the teacher's effectiveness.

4. Preparation in curricular materials is helpful if teachers are convinced of the underlying philosophy and teaching practices advocated in the materials.

5. Student's attitude toward school and the teacher influences a teacher's effectiveness.

6. Administrative support and encouragement are considered very important by science teachers.

7. Administrators who are flexible (idiographic) are well-liked by teachers.

8. Lack of science equipment and supplies greatly reduces the teacher's use of laboratory activities.

It is logical to conclude that the present study should include a study of some selected variables to determine their relationships to a teacher's utilization of inquiry-oriented activities. The results of this study should suggest an indication of some variables with a bearing on science teachers and science instruction.

Follow-Up Studies of Teacher Education Programs

An increasingly large number of programs are providing an extensive field-based and/or competency-based curriculum. Inservice and preservice education programs are being organized for particular aims such as the use of specific curriculum materials, questioning techniques, inquiry techniques and other teaching practices. Constant changes in the curriculum have sparked a necessity for and interest in careful evaluations of their impact.

Sherwin (1974) reported that 84 percent (respondents) of the American Association of Colleges for Teacher Education (AACTE) member institutions, or 603 in actual numbers, are employing some form of follow-up studies of their graduates. This section deals with 15 of the most recent studies in this area.

Ronald D. Adams (1974) of Western Kentucky University at Bowling Green conducted a pilot study to field-test a theoretical model for the evaluation of a teacher education program, using J. T. Sandefur's illustrated model (1970). Forty preservice teachers each year were to be observed during their student teaching, toward the end of their first year of teaching, after three years, and, finally, after five years of teaching. The results of Phase I (during the preservice and first year of teaching) were published in 1974. Of the initial 40 volunteer subjects (20 elementary and 20 secondary) only 22 (15 elementary and 7 secondary) were followed in their first year of teaching.

A battery of instruments was administered during student teaching and later in the first year of teaching. It included:

1. Career Base Line Data Questionnaire.
2. Personality Scale.
3. Rating Scales.
    - A. Teacher evaluation by peer/supervisor.
    - B. Student evaluation of teaching.
4. Classroom Observational Record.
5. Interaction Analysis.

While the results indicated that this model can be used successfully, the small population sample was a definite limitation. Another was the absence of information on what subjects were taught by the secondary teachers. The major conclusions were:

1. Elementary teachers became less authoritarian after one year of teaching experience.

2. There was no difference between the cooperating teacher's ratings of student teaching behavior and peer and supervisor ratings after one year's teaching.

3. The secondary supervisor's ratings were lower than the cooperating teacher's ratings for the teaching dimension "Relations with students."

4. Pupil ratings were not significantly different between student teaching and the first year of teaching.

5. Classroom interactions for elementary as well as secondary school teachers did not differ significantly after one year of teaching experience.

J. T. Sandefur (1967), collaborating with others, conducted an experimental program at Kansas State Teachers College at Emporia to (1) identify and organize knowledge related to teaching and learning, (2) design and implement a series of laboratory experiences, and (3) evaluate the extent to which teacher behavior was affected.

Essentially the researchers attempted to coordinate laboratory experiences, allowing observation and participation with appropriate readings, and to conduct the whole program in a relatively informal, non-threatening seminar context. The sample was formed of 62 teachers in the experimental program and 52 in a conventional program within the same institution. Data on classroom behavior were collected during student sessions using Ryan's _Classroom Ooservation Record_, and Hough's modification of _Flander's System of Interaction Analysis_. Additional data were collected using student teaching grades and _National Teacher Examinations_.

The analysis of data revealed that experimental teachers used many more desirable behaviors compared to the control group that were termed as fair, democratic, original, responsible, showing acceptance and use of pupils' ideas. The pupils in their classrooms were judged as more alert, responsible, initiating, fair and democratic than the pupils in classrooms taught by conventional program graduates.

The Mid-Continent Regional Educational Laboratory (McRel) was actively engaged with 28 different colleges and universities at the end of 1974 in a field-based program entitled Cooperative Urban Teacher Education (CUTE) for the preparation of teachers in urban schools (Soptick and Clothier, 1974). The program development, from 1967, when it was originally started in four midwestern cities, to its present size, has been gradual and systematic. In Phase I (Installation) the goal was achieved to implement this program at eight different sites. Phase II (Diffusion) involved using the original eight sites for dissemination of the program to another 20 sites. At the end of 1974 about 2,000 graduates had been given this training.

The objective of the program was to develop a teacher's ability to understand the environment, attitudes, insecurities, culture and prejudices of himself and his students and the development of teacher competency in inquiry teaching methods. The curriculum for the program replaced the regular student teaching and was completed during 16 weeks of training. Those students who expressed a desire to teach in urban schools were enrolled in the program. The program included training in three components -- mental health, sociocultural and teacher education.

In the sociocultural component students were required to participate in many field experiences in the community in which they would be teaching. It was more than just a tour of the community. Volunteer work with community agencies, tutoring pupils in their homes, observing in the waiting room of a hospital in the community, or doing a sociological case study of an individual pupil during the semester were some of the recommended experiences. Another part was called "live in," in which students spent some time with a family in the community. McRel resource people from the community interacted with students. Thus an opportunity for internalization of feelings and understandings about community life was provided.

The mental health component involved discussion sessions under the guidance of a psychologist or a psychiatrist. They delved into the students' anxieties, prejudices, attitudes and defense mechanisms. Children's emotional and psychological development were studied and discussed. CUTE teachers were enabled to understand and become better able to cope with the immediate pressures of involvement in inner city schools every day.

The third aspect, teacher education, placed an emphasis on inquiry teaching methods. Pupils were encouraged to ask questions, to suggest alternatives and to explore possible solutions.

An early follow-up study of this program was reported by Comeaux (1971) for the period of 1967-70. This study included comparing the employment status of 295 CUTE graduates to 231 comparison graduates. In 1971 a significantly greater proportion of female graduates of the CUTE program, as compared to non-CUTE female graduates, taught in inner city schools and planned to remain there. A significantly greater proportion of male CUTE graduates remained in inner city schools as compared to the non-CUTE comparison group of graduates.

In another study the evaluation was conducted first at the eight sites by the McRel staff and later at the rest of the 20 sites during 1973-74. The components of the evaluation plan included:

1. Individual site reports by the on-the-site staff.
2. Monitor reports (prepared after the site visits by the McRel staff).
    - A. Responses to a form reporting individual interviews with the site directors.
    - B. Responses to an evaluation checklist.
    - C. Narrative summaries by monitors regarding weaknesses and strengths of a site.
3. Student data.

In the early stages each student was administered the following tests three times during the semester (beginning, after the first eight weeks and at the end of the semester): Cultural Attitude Inventory, *Teaching Situation Reaction Test*, *Semantic Differential*, and *Personal Orientation Inventory* (POI). The results indicated significant changes in students on a third of all the variables.

In the latest evaluation (1973-74) POI, and a newly developed CUTE *Quiz*, were administered at the beginning and at the end of the semester. The POI is a standardized test to assess the extent an individual is "self-actualized." There are 14 sub-scores and two ratio scores are delineated from this instrument. CUTE *Quiz* tests the student's mastery of major concepts and goals of teacher education and the sociology components of the program. The quiz is composed of 50 items (agree/disagree type) with questions of a cognitive and affective nature. The results of the 1973-74 study revealed significant gain scores by the graduates from pre- to post-tests on the *Quiz*, and nine out of 14 sub-scores on POI. The 1973-74 CUTE students compared favorably to Maslow's criterion group of self-actualized persons.

In 1974 Gould (1974) reported the conclusions of the general evaluation studies of the Cooperative Teacher Education Project (CTEP) conducted in conjunction with High School District #214 at the University of Illinois (Urbana campus), Northern Illinois University, and Northeastern Illinois University. The secondary teacher education program is characterized by extended experience in elementary, junior high and high school. The students progressed through observation, mini-teaching, team teaching, individualized instruction and full-time teaching for approximately eight weeks.

Follow-up questionnaires were used to assess job-taking characteristics of CTEP graduates and conventional program graduates. In an analysis made in 1973, the proportion of CTEP science graduates taking teaching positions following graduation was twice that for the comparison group.

Another study (in progress) is related to the development of self-concept in CTEP graduates. Two instruments that were used were *Personal Orientation Inventory* (POI) and *Occupational Characteristics Inventory*. Preliminary results indicated that CTEP candidates began the program with a significantly greater tendency toward self-actualization and self-acceptance than did candidates of the comparison group.

A Lickert type *Illinois Teacher Evaluation Questionnaire*, consisting of 40 descriptive items on teacher behavior in the classroom, was administered to about 8,000 pupils. The Chi-square statistic analysis showed significant differences across training programs, with the difference in favor of conventional student teaching.

The *Minnesota Teacher Attitude Inventory* was administered in still another study to 92 CTEP candidates. The scores were collected at the beginning of the program and 18 weeks later at the conclusion of the "extended teaching" component. Pre- and post-scores were significantly different.

> The effects of the CTEP program were about as debilitating as in more conventional programs. Altruism and idealism seemed to dissipate over the CTEP experience, perhaps in favor of a more realistic outlook. (Gould, 1974, p. 8)

Coyne (1970) reported the results of a comparison study between the conventional teacher education program and the new Missouri Western Continuum Program. The new program was characterized by 54 weeks of classroom experience starting from the sophomore year, and the replacement of education courses, per se, by seminars with the faculty and school personnel. Sixty matched pairs of sophomores with education majors were selected according to their high school and college cumulative grade point averages and interest fields. The members of each pair were then randomly assigned to either the conventional or the new program. After the final student teaching three types of data were collected on each pair.

The information collected included scores on proficiency examinations, student questionnaires, and the evaluation of a student's performance as observed by school administrators from video tapes. The t test for paired groups was used to analyze the data. The findings of the study were:

1. The supervisors' evaluations of the students in the new program were significantly superior to that of the comparison group.

2. The students in the new program had a significantly superior attitude toward the concurrent education courses

than the comparable group.

3. Perceptions (visual and written) of the students in the new program concerning the analysis of the teaching situations included in a questionnaire were significantly superior to those of the students in the conventional program.

Wass and Combs (1974) reported the results of a follow-up study for the evaluation of a humanistic teacher education program at the University of Florida. The techniques used in this study open a way for further research in the area of humanistic programs for teacher education.

The experimental program, based on a perceptual-humanistic theory and extended field-based interneship program, was started in 1969 side by side with the regular program. The program was designed to provide opportunities for the development of the teacher's "self as an instrument ... to carry on the educational functions." (p. 125)

To evaluate the program three instruments, two behavioral and one perceptual, were used. These were Teacher Practices Observation Record (TPOR), Reciprocal Category System (RCS), a modification of Flanders' System, and the Perceptual Dimension Scale (PDS).

The sample consisted of 65 teachers, 35 of whom graduated from the new program and 30 from the regular program in 1970-71. A team of two observers out of a total of seven were assigned the task of observing a teacher for at least three hours and completing three instruments pertaining to that teacher. The observers were not given the information that a particular teacher was or was not from the control or experimental program. The analysis of the data indicated that the teachers from the experimental group had a significantly higher total score on the perceptual dimensions than did the control teachers. On the behavior observations, the teachers in the experimental group used significantly less teacher-centered right answer focus, i.e., traditional teaching. The experimental teacher often showed more positive verbal interactions than did the teachers in the control group but it was not at a statistically significant level.

A cybernetic model for the revision of the teacher education program with evaluation as an integral part was implemented at Fairmont State College in Fairmont, West Virginia (1973). The new curriculum for elementary, secondary, and K - 12 preservice teachers was proposed in three phases. Phase I, Professional Educational Core, included a sequence of four education courses. Phase II, Initial Performance Practicum, was a performance-based, criterion-referenced three-faceted program. The facets were theory, clinical experience, and student teaching. Phase III was labelled Graduate Assessment Record and included a regular provision for following the graduate's progress during the first year of teaching.

Phase III was implemented by sending two questionnaires, one each to the graduates and their supervisors. The opinions of the graduates (1971-72) were gathered regarding the adequacy of their preparation in the five major areas -- planning, instruction, human relations, classroom management, and evaluation. The supervisors' questionnaire also included these five areas and an additional area of personal qualities.

The analysis of the data revealed that the supervisors generally regarded the graduates as good to excellent teachers. The graduates perceived themselves as fair to above average teachers. Certain weaknesses in the program were also reported by the respondents. The program was modified to include micro-teaching, an instructional media laboratory, and increased field experience and performance-based criteria in Phase I. No study has been published after the first set of changes were put into effect.

A follow-up study was conducted at Portland State University to evaluate the undergraduate teacher education program (Duncan, 1973). A product evaluation model was used in the study. Four criterion variables were identified which were directly related to program objectives -- teacher performance of program objectives, cognitive achievement, attitude toward teaching, and perception of program procedures. The criterion measures developed or adopted were:

1. Teacher Behavior Rating Instrument.
2. Measure of Cognitive Knowledge Related to Teaching.

3. Concerns About Teaching.
4. Perceptual Inventory of Program Procedures.

The sample was drawn from students entering the program in 1973, student teachers graduating in 1973, and voluntary graduates (follow-up group), from the 1969-70 school year. The analysis of the data showed few differences in the accomplishment of the objective of the program by the existing group and the follow-up group. No differences were observed in cognitive achievement between the entering group and the existing group.

In a study Colella (1974) compared the attitudes and behaviors of recent graduates of the experimental and the traditional teacher education models at Seton Hall University in South Orange, New Jersey. The subjects of the study included 35 first-year graduate teachers from each of the two programs. The instruments used included the Minnesota Teacher Attitude Inventory, the Appraisal of Teacher Service, and the Flanders System of Interaction Analysis.

A one-way analysis of variance treatment of the data revealed the following:

1. The majority of the experimental graduates reflected an uncritical positive attitude toward

teaching as compared to the critical authoritarian attitude of the traditional program graduate.

2. The mean of the instances of indirect teacher talk and student was higher for the experimental graduates, and the mean of the instances of direct teacher talk was higher for the traditional program graduate.

An evaluation study was conducted at the University of Montana at Bozeman by Morin (1973) which included the past graduates, principals and counsellors, cooperating teachers, pupils, parents and preservice students. All these subjects were asked to respond to two Likert type opinionaires regarding the benefit of the field-based preservice program. The analysis of data revealed feedback extremely favorable to the program.

The Iowa-Upstep Program was evaluated in 1970-72 by Pizzini (1974) in a study with a three-fold purpose:

1. To determine initial measures of self-concept, dogmatism, and science teaching philosophy of prospective teachers.

2. To determine changes in the above after participating in the Iowa Upstep I and II programs.

3. To determine the effects of an early

exploratory experience program on the development of attitudes toward teaching and selected concepts.

Participants were prospective science teachers enrolled in the Iowa program during 1971-72. Instruments used included the Tennessee Self-Concept Scale, the Science Teaching Assessment Test, the Rokeach Form and Dogmatism Scale, the Minnesota Attitude Teacher Inventory and the Semantic Differential for Selected Educational Concepts. The findings generally suggested that the experimental program was effective in contributing to positive growth in self-concept, science teaching philosophy, and attitude toward educational concepts.

Grover and others (1973) completed a year-long comparative study of seven different models of teacher education at Western Washington State College in Bellingham. Six of the programs studied were field-based and in operation simultaneously along with the seventh program, which was the conventional one. The field and clinical experience ranged in these programs from one quarter (conventional) to one full year. Data were collected on 114 subjects participating in seven programs.

A large number of variables studied were divided into three categories -- entry characteristics, program and setting characteristics and exit characteristics. The data collection involved gathering information from student files, their leaders, and at least three observations in the classroom. The procedure used for the classroom observations was described as "eclectic and systematic."

The statistical analysis of the data including factor analysis, discriminant function analysis and multivariate analysis techniques were performed. None of the factors studied accounted for more than 10 percent of the variance. The candidates from different programs differed significantly on two cluster variables -- verbal "direct" influence and observed pupil attention to task. The investigators concluded that the grade level taught must be considered as an important factor in comparative studies such as this one.

The studies reviewed in this section suggest the following trends:

1. A majority of follow-up studies have been conducted after 1970.
2. The feedback received from such studies points out useful information which can be used to improve preservice programs.
3. Criteria utilized in follow-up studies have included the use of checklists, questionnaires, direct classroom observation, preservice records, and appraisal of teachers by supervisors and other observers.

Research on the Field-Based Preservice Secondary Science Teacher Education Program at The Ohio State University

The description of preservice secondary science teacher education program, to which this study is related, is given in Chapter I. Initial forms of this program started in 1969-70 and have been used since then in modified forms. Several researches have attempted to measure the impact of this program on the preparation and performance of teachers in schools.

Sagness (1970) evaluated the impact of the early involvement in schools with contrasting environmental settings. The particular program described (termed as "project" versus the other program at The Ohio State University, "non-project") was in its early stages of development in 1969 and overlapped with a conventional teacher education program. The criterion variables were selected as the views of project and non-project students regarding the classroom activities for "urban" and "sub-urban" settings during the first professional and student teaching quarters. By developing a suitable instrument, Science Classroom Activity Checklist (SCACL), Sagness assessed the activities used by student teachers enrolled in the "project" and "non-project" programs.

In addition, Sagness (1970) attempted to find out the compatibility of project and non-project students for working with culturally deprived students in inner city schools. He concluded that project students had less restrictive views about using laboratory activities and they encouraged more student participation in classrooms as compared to non-project students. The knowledge of project students regarding the culturally deprived students was significantly higher than that of the non-project students. However, the scores of project students at the end of the student teaching quarter were not significantly different from their scores obtained in the first professional quarter. The investigator reported significant correlations of 23 selected variables with the criterion variables. The selected variables were drawn from the areas of student characteristics, teacher characteristics, and environmental settings.

Another major contribution which Sagness (1970) made was the development of the Science Classroom Activity Checklist (SCACL). The checklist was developed from the instrument that Kochendorfer and Lee designed for use with the Biological Sciences Curriculum Studies teachers. SCACL was developed in two parallel forms, one to be completed by students and the other to be completed by the teachers. SCACL:TP provides information on the views of science teachers regarding the classroom activities which should be used in classrooms. On the other hand, SCACL:SP gives data on the activities which are used in the classroom as perceived by students. The revised forms include 60 parallel statements to be answered as True or False. The KR-20 and KR-21 reliability estimates for the revised forms were reported for the SCACL:SP as .74 and .73 respectively. These estimates for the SCACL:TP were reported as .77 and .73 according to KR-20 and KR-21 techniques respectively.

There are seven sub-scales in the checklists which are:

1. Student classroom participation.
2. Role of the teacher in the classroom.
3. Use of textbook and reference materials.
4. Design and use of tests.
5. Laboratory preparation.
6. Type of laboratory activities.
7. Laboratory follow-up activities.

A composite score on this checklist provides information on the nature of classroom activities.

Cignetti (1971) and Brewington (1971) did follow-up studies on first-year teachers graduated from the "project" and non-project programs. Cignetti selected his sample from the first-year project and non-project teachers and a comparable group of non-graduate teachers (from The Ohio State University). The total sample was composed of 43 teachers in 18 different schools.

The conclusion of this study revealed that The Ohio State University non-project teachers appeared to hold more restrictive and less open-ended views for the types of laboratory activities which should be used in classrooms compared to project teachers from The Ohio State University. The Ohio State University project and non-project teachers did not change significantly the types of activities used during the year. Comparing The Ohio State University project to the graduates from the other institutions, it was found that the former group had significantly higher composite scores on the Cultural Attitude Inventory. The Ohio State University project teachers had significantly higher scores on the knowledge sub-scale of CAI compared to The Ohio State University non-project teachers. The views of both project and non-project teachers regarding the classroom activities as measured by SCACL:TP were not significantly different.

Brewington (1971) worked with 26 teachers graduated from The Ohio State University in his follow-up study. Of these teachers 10 were enrolled in the project while another 16 were enrolled in the non-project. The design of this study was quite similar to that of Cignetti. The differences between the two studies were that Brewington was concerned with comparisons between the project and the non-project teachers and Cignetti concentrated mainly on studying the differences between The Ohio State University graduates (project and non-project teachers combined) and those who were not graduates of The Ohio State University.

Brewington (1971) reported that as the school year progressed non-project teachers from The Ohio State University changed significantly their perceptions of the types of science classroom activities, the changes veering toward allowing less student involvement in class activities. Project teachers did not change significantly their perceptions of classroom activities during the year. Project teachers tended to be more inquiry-oriented and preferred innovative strategies more than did the non-project teachers. The attitude toward or knowledge of culturally deprived students showed a decline in non-project teachers while these did not change significantly for project teachers.

Brown (1972) studied the two science education programs (project and non-project) much like Sagness. The criterion variables used were the preservice teacher's views of the types of classroom activities which should be used in urban and suburban settings, the type of activities used by preservice teachers during student teaching, the student teacher relationships, the personal adjustment of preservice teachers, and knowledge and attitude toward culturally deprived students.

In addition to the use of SCACL:SP and SCACL:TP, and CAI which Sagness had used in his study, Brown developed and used Checklist for Assessment of Science Teacher (CAST) in the two parallel forms, Checklist for Assessment of Science Teacher: Supervisor's Perception (CAST:SP) and Checklist for Assessment of Science Teacher: Pupil's Perception (CAST:PP). The checklist has 15 questions, five in each of the three areas -- student teacher relationships, teacher's personal adjustment, and classroom activities. A detailed description of CAST is included in the section on instrumentation.

Major conclusions of this study were:

1. Project and non-project student teachers differed significantly in terms of the types of classroom activities used, as measured by a sub-score on CAST:SP (completed by cooperating teachers). Differences reported were in favor of project student teachers.

2. Project and non-project student teachers differed significantly on the teacher pupil relationship scale. More positive teacher pupil relationships were reported for project student teachers than non-project student teachers.

3. Project student teachers showed significant changes in their views regarding classroom activities to be used in urban and suburban settings as compared to the non-project student teachers.

4. Both project and non-project student teachers did not show significant changes in their attitude or knowledge of culturally deprived students.

5. The two groups were not significantly different on the personal adjustment sub-scale of CAST.

6. Significant positive correlations were reported between CAST:SP, CAST:PP and SCACL:SP.

Lucy (1972) evaluated the effectiveness of individualized science laboratory activities which are an essential part of the five-quarter teacher education program. This aspect of the program was added to improve the prospective science teacher's understanding of the nature of science. The sample for this study consisted of 129 students enrolled in the science education methods course during Winter 1969 through Spring 1970. The instruments used included Wisconsin Inventory for Science Processes (WISP), Laboratory Surveys, and Activity Reaction Sheet. The report on formative evaluation revealed that the students considered the activities as appropriate and their attitude was favorable. Some activities were judged to be too time-consuming. The summative evaluation indicated that these activities were most helpful in increasing the understanding of the higher order processes of science. Significant gains occurred in WISP scores after the program.

Deamer (1973) investigated the perceptions held by individuals involved in the preservice program. The population for the study consisted of principals of cooperating schools in eight school districts, preservice teachers, and college supervisors. Data were collected by means of five Q-sort instruments, Personal Data Questionnaire, and the Education Attitude Scale. Data from the Q-sort were analyzed to determine the relationship that existed between various groups involved in the program. The other two instruments provided information on the background and educational attitudes of participants. Analysis of the data revealed that principals, preservice teachers, cooperating teachers and supervisors differed significantly in perception of the attainment of general objectives for science teacher preparation.

Significant differences were reported between the appropriateness of objectives for preservice teachers at different stages in the program. Preservice teachers in the second quarter (J_2) were more concerned about concept formation, motivation, self-evaluation, and individual differences. They were more concerned in the third quarter (J_3) about teacher pupil interactions, use of effective inquiry strategies, and teaching-learning environment. Preservice teachers perceived appropriate objectives in the fourth quarter (S_1) as "good" teacher characteristics and planning skills. During the full-time student teaching (S_2) the objectives considered most appropriate were conducive learning atmosphere, pupil teacher interaction, and effective teaching strategies.

To summarize, in this section six studies were reviewed connected with the preservice secondary science teacher education program at The Ohio State University. These studies have shown that:

1. Preservice teachers in the program encouraged more student participation in classrooms than the ones in the conventional preservice program.

2. The knowledge of preservice students in the program regarding culturally deprived students was significantly higher than the ones in the conventional program.

3. Preservice teachers in the program differed significantly in the student and teacher relationship from the ones in the conventional preservice program.

4. Graduates from the preservice program, in comparison to the graduates from other universities, possessed wider knowledge and better attitudes toward culturally deprived students.

5. During the first-year teaching assignments, the graduates from the preservice program changed their views regarding the type of classroom activities less than the graduates from the conventional program.

6. Individualized laboratory activities helped to increase the understanding of the nature of science.

7. Preservice teachers changed their perceptions of appropriateness of objectives as they progressed through the five-quarter sequential program.

Summary

In this chapter, research studies were reviewed concerning three major areas. First, research evidence related to identification of various independent variables having an impact on teachers' behavior in schools was categorized according to characteristics of the teacher, students, administrators and situational. Certain specific variables belonging to the four categories were recognized, at the end of a particular section, which should be included in a study related to teacher behavior. The list of the variables identified included teacher pupil relationships, teacher's personal adjustment, teacher's preparation in curriculum materials, students' attitude toward course and teacher, administrative support, basic laboratory equipment and many other variables.

Second, a number of follow-up studies were reviewed. It is evident that study of the performance of graduates in schools provides useful feedback for the improvement of a teacher education program. Most follow-up studies reported were conducted using first-year teachers.

Third, studies related to field-based preservice programs for secondary science teachers at The Ohio State University were reviewed. It was evident that program graduates used more inquiry-oriented activities, an objective of the program, in classrooms than other comparable graduates during student teaching and the first year of teaching. It seems that a study of graduates during their teaching careers beyond the first year should provide additional significant information on the effectiveness of the preservice program.

The present study includes aspects which are based on conclusions drawn from reviewed research. This study is an attempt to follow up graduates beyond the first year after graduation up to five years of inservice experience. In addition, a large number of variables which include some variables identified in this chapter and some new (such as the administrator's views on science teaching, discipline, and the like) are to be studied for their impact on the science teacher's use of inquiry-oriented activities.

CHAPTER III

THE STUDY -- DESIGN AND METHOD

This chapter contains a description of the following three aspects:

1. Population and Sampling.
2. Procedures for Data Collecting.
3. Selected Instruments.

Population and Sampling

The population was composed of teacher education graduates with a major teaching specialization in any field of science (physics, chemistry, biology, general science, comprehensive science, physical science and earth science). A list of all the graduates with the above specializations was compiled for the periods 1969-70, 1970-71, 1971-72, 1972-73 and 1973-74 from the records in the main office of the College of Education. This list was checked against the records available in the Educational Placement Office to get more recent information regarding the employment status of the graduates. A final list was then prepared of graduates who were employed as full-time teachers in the state of Ohio during the 1973-74 year. Along with this, an attempt was also made to contact a total of 40 graduates (with no records in the Educational Placement Office) on their permanent addresses.

An initial letter was mailed to the principals of the schools to confirm the placement of the graduates and to seek their approval for conducting the study in their school buildings. A typed postcard was enclosed with the letter for their responses (Appendix D). Responses were received from 92 out of a total of 135 letters during the two weeks following the mailing. The investigator made telephone contacts with the administrators of the rest of the schools. A total of seven principals responded by indicating a new placement address for the concerned graduates. Still others, numbering 22, indicated the discontinuance of the graduates at their schools and no knowledge of the present place of employment.

All the information thus provided was immediately followed up by a telephone call and a formal letter. Two principals reported that the graduates concerned were full-time mathematics teachers instead of science. Five principals refused to give their permission initially for the conduct of the study. The investigator, however, was able to persuade three of the five to participate by explaining the importance and procedural details of the study in telephone conversations. The other two principals (responsible for six employed graduates) were unwilling to allow the study in their buildings.

After receiving the official approval from the school principals, a letter of request for participation in the study was sent to the individual teachers. Enclosed with this were a brief description of the type of data to be collected and the selected instruments. Six teachers refused to participate, citing personal apprehensions.

The final list contained 94 sample teachers. Of these, only 89 returned the completed responses to the instruments in time for the study. Further data from three teachers could not be used for analysis due to lack of information on the type of preservice program attended by them. Table 1 presents a breakdown of the 86 graduates participating in the study.

The number of participants for the year 1969-70 was eight. These participants were enrolled in the Senior Project. No graduates enrolled in the traditional (one quarter) preservice education program were selected for this study. The number of graduates for the years 1970-71, 1971-72, 1972-73, and 1973-74 was 18, 19, 21, and 20 respectively.

TABLE 1

NUMBER OF TOTAL GRADUATES, GRADUATES TEACHING IN OHIO IN 1973-74 AND PARTICIPATING GRADUATES

	Total Number of Graduates		Graduates Employed in Ohio		Number of Graduates Participating
	Traditional	Project	Traditional	Project	
1969-70	61	21	*	10	8
1970-71	39	41	*	30	18
1971-72		72		22	19
1972-73		40		23	21
1973-74		50		30	20

*Figures unavailable

N = 86

Comparisons Between Participating Versus Non-Participating Population

Preservice data were collected on four selected variables for all the graduates regardless of their place or current status of employment. The selected variables were pre-professional grade point average (Entry GPA), grade point average in professional education (EDP GPA), cumulative grade point average (CUMU GPA), and preservice composite score on *Science Classroom Activity Checklist: Teacher's Perceptions* (SCACL:TP PRE).

Means and standard deviations on all these measures are presented in Table 2. The range of mean Entry GPA for participating graduates was between 2.66 and 2.94 as compared to 2.69 and 2.80 for non-participating graduates. Similarly, the mean EDP GPA for participants ranged from 3.00 to 3.20, and for non-participants from 2.91 to 3.07. The mean CUMU GPA ranged from 2.75 to 2.99 for participants and from 2.80 to 3.02 for non-participants. The mean SCACL:TP PRE scores ranged from 49.44 to 54.66 for participants and from 49.35 to 53.36 for non-participants. The number of participants and non-participants with available data on all four variables totalled 65 and 84 respectively.

Further statistical analysis was performed by multivariate analysis of variance using Clyde's MANOVA program (Appendix A). Two factors, participants versus non-participants and years of graduation, were analyzed for their separate interaction effects. Data for 1969-70 were not included in this analysis since complete data were available on the four variables for only one participant.

No significant differences were found on the four variables (Entry GPA, EDP GPA, CUMU GPA, and SCACL:TP PRE) between the sample of this study and the rest of the graduates (Table 3). However, the SCACL:TP (Preservice) scores for 1973-74 graduates (both participants and non-participants) were significantly different from groups in other years (Table 4). The differences within the year 1973-74 between participants and non-participants were not significant. The effect of including a sample having lower SCACL:TP Preservice scores with the rest of the sample having higher SCACL:TP Preservice scores was further considered by studying their SCACL:TP Inservice scores (p. 111 and p. 116). The changes in scores from preservice to inservice on SCACL:TP were non-significant for all the sample teachers including 1973-74 graduates (Table 21). Thus the effect of initially low SCACL:TP Preservice scores for one group was considered unimportant so long as the change scores were not significant among the groups.

No significant interaction was found between the two factors, participants versus non-participants and years of graduation (Table 5).

TABLE 2

MEANS AND STANDARD DEVIATIONS ON SELECTED VARIABLES FOR PARTICIPATING AND NON-PARTICIPATING GRADUATES

		Participants in Study					Non-Participants in Study				
Year of Graduation		N	Entry GPA	EDP GPA	CUMU GPA	SCACL:TP PRE	N	Entry GPA	EDP GPA	CUMU GPA	SCACL:TP PRE
1970-71	M	18	2.66	3.01	2.77	53.15	44	2.70	3.07	2.83	53.36
	S.D.		0.44	0.42	0.41	2.89		0.41	0.39	0.37	3.98
1971-72	M	10	2.92	3.20	2.98	54.60	11	2.69	2.91	2.80	52.54
	S.D.		0.56	0.44	0.46	3.02		0.44	0.32	0.40	1.91
1972-73	M	18	2.94	3.09	2.99	54.66	12	2.77	2.99	2.89	53.16
	S.D.		0.50	0.40	0.40	2.30		0.44	0.39	0.38	3.78
1973-74	M	19	2.66	3.00	2.75	49.44	17	2.80	3.05	3.02	49.35
	S.D.		0.29	0.36	0.41	4.07		0.83	0.39	0.37	4.45

Total N = 149

TABLE 3

TESTS OF SIGNIFICANCE ON SELECTED VARIABLES FOR PARTICIPANTS VS. NON-PARTICIPANTS

MULTIVARIATE TESTS OF SIGNIFICANCE USING WILKS LAMBDA CRITERION

Test of Roots	F	DEHYP	DFEER	P Less Than
1 through 1	1.430	4.000	138.000	0.227

UNIVARIATE F TESTS

Variable	F (1,141)	MEAN SQ	P Less Than
Entry GPA	0.048	0.012	0.827
EDP GPA	0.190	0.030	0.664
CUMU GPA	0.379	0.060	0.539
SCACL PRE	1.183	15.442	0.279

TABLE 4

TESTS OF SIGNIFICANCE ON SELECTED VARIABLES FOR YEARS OF GRADUATION

MULTIVARIATE TESTS OF SIGNIFICANCE USING WILKS LAMBDA CRITERION

Test of Roots	F	DEHYP	DFEER	P Less Than
1 through 3	3.530	12.000	365.405	0.001
2 through 3	1.043	6.000	277.000	0.397
3 through 3	0.038	2.000	139.000	o.962

UNIVARIATE F TESTS

Variable	F (3,141)	MEAN SQ	P Less Than
Entry GPA	0.932	0.231	0.427
EDP GPA	0.057	0.009	0.982
CUMU GPA	0.868	0.137	0.460
SCACL PRE	11.710	152.899	0.001

TABLE 5

TESTS OF SIGNIFICANCE ON SELECTED VARIABLES FOR INTERACTION BETWEEN PARTICIPATION VS. NON-PARTICIPATION AND YEARS OF GRADUATION

MULTIVARIATE TESTS OF SIGNIFICANCE USING WILKS LAMBDA CRITERION

Test of Roots	F	DEHYP	DFEER	P Less Than
1 through 3	0.930	12.000	365.405	0.517
2 through 3	0.847	6.000	277.000	0.534
3 through 3	0.070	2.000	139.000	0.933

UNIVARIATE F TESTS

Variable	F (3,141)	MEAN SQ	P Less Than
Entry GPA	0.866	0.215	0.461
EDP GPA	1.223	0.192	0.304
CUMU GPA	1.788	0.283	0.152
SCACL PRE	0.803	10.484	0.494

The data on the teacher's descriptive variables were collected from the Teacher's Questionnaire (TQ). There were 86 respondents.

Sex, Age, and Marital Status

The teacher sample was constituted of 60 men (69.7 percent) and 26 women (30.3 percent). The teachers ranged in age from 22 years to 52 years, with a median of 25.46 years, and a mode of 24 years. Table 6 presents the different categories of age. There were more married teachers (61, or 70.9 percent) than unmarried teachers (25, or 29.1 percent).

TABLE 6

AGE OF SAMPLE TEACHERS

Age in Years		21-22	23-24	25-26	27-28	29-30	Over 31	MEAN	S.D.
Teachers Reporting	Freq.	2	29	32	15	4	4	26.18	4.31
	Percent	2.3	33.7	37.1	17.4	4.5	5.6		

Placements

The sample teachers were employed in seven different types of schools. The breakdown of schools according to the grades incorporated is presented in Table 7 .

TABLE 7

TYPES OF SCHOOLS EMPLOYING SAMPLE TEACHERS

Grades in Schools		6-8	7-8	7-9	10-12	9-12	9	Correctional School-Girls
Teachers Reporting	Freq.	13	5	21	10	34	2	1
	Percent	15.1	5.8	23.2	11.6	39.5	2.3	1.1

Preparation

The sample teachers received their preservice professional education in one of the five different plans. The structure of the different plans was mainly based on the amount of time spent (ranging from two to five quarters) and related experiences. The five-quarter sequence constituted three quarters, usually in the junior year, and two quarters in the senior year. This is indicated as a $\underline{J_1, J_2, J_3, S_1, S_2}$ or $\underline{J_1, J_2, J_3\ S_2, S_x}$ sequence, the S_x being an alternate experience to the typical classroom teaching. Earth science education graduates were enrolled in a special program, SFE or ESRQ, during one of the professional education quarters. This program is devoted to field experience and conducting field studies. Post-Degree graduates received in-school experience for three quarters. The Senior Project, with two quarters in-school experience, was participated in by nearly one third of the sample teachers. Table 8 shows the breakdown of the sample teachers according to the program types.

TABLE 8

TYPES OF PRESERVICE PROFESSIONAL EDUCATION PROGRAM FOR SAMPLE TEACHERS

Types of Program		Senior Project	J_1,J_2,J_3 S_1,S_2	J_1,J_2,J_3 S_2,S_x	ESRQ or SFE	Post-Degree
Teachers Reporting	Freq.	31	30	5	10	10
	Percent	36.0	34.9	5.8	11.6	11.6

Teaching Load

Information was collected on the number of teaching periods per day and per week (Table 9). Two sample teachers taught three or less periods per day (2.2 percent), 42 taught four or five periods per day (48.9 percent), and 42 taught six or seven periods per day (48.9 percent). These teaching loads were higher than the national average (Schlessinger et al., 1973), which in 1971 for these categories were 64 percent, 33.3 percent and 2.5 percent respectively.

TABLE 9

NUMBER OF TEACHING PERIODS

	NUMBER OF TEACHERS REPORTING	
Teaching Periods Per Day	Frequency	Percent
1 - 3	2	2.2
4 - 5	42	48.9
6 - 7	42	48.9
Teaching Periods Per Week		
1 - 15	2	2.2
16 - 25	42	48.9
26 - 35	42	48.9

The number of subjects (preparations) taught varied from one to three for the sample teachers. However, only one person reported teaching a subject unrelated to his major/minor field of study at the university. Table 10 presents the data on the number of subjects taught.

TABLE 10

NUMBER OF SUBJECTS TAUGHT BY SAMPLE TEACHERS

Number of Subjects Taught		1	2	3
Teachers Reporting	Frequency	30	30	26
	Percent	34.9	34.9	30.2

Size and Type of Class

Each sample teacher reported information regarding the particular class in which student data were collected. The number of students in class varied considerably for different teachers, ranging from 3 to 42. The mean class size was 28 students (figure rounded). Table 11 presents a further breakdown on class size.

TABLE 11

CLASS SIZE FOR SAMPLE TEACHERS

Number of Students in the Class		Less Than 10	11-15	16-20	21-25	26-30	31-35	36-40	Over 40
Teachers Reporting	Freq.	4	5	15	26	25	6	4	1
	Percent	4.5	5.9	17.4	30.3	29.1	6.9	4.5	1.1

The types of classrooms where "student" data were collected were characterized as "regular" by 63 teachers, "advanced" by 18, and "modified" by 4 teachers. One teacher did not respond to this item.

Procedures for Data Collection

Distribution of Materials

After the selection of the sample in the last week of March, 1975, the packets containing the instruments were prepared for each sample teacher. Each packet contained the appropriate number of pupil instruments (Checklist for Assessment of Science Teachers: Pupil Perceptions, or CAST:PP and Student Questionnaire or S.Q.) to be administered in a single science classroom taught by a sample teacher, three teacher instruments (Science Classroom

Activity Checklist: *Teacher's Perceptions*, or SCACL:TP, *Teacher Questionnaire*, or T. Q., and *Facilities Checklist*, or F. C.), instruction sheet for administering the instruments (see Appendix C), and a sufficient number of DIGITEK response sheets for one pupil and one teacher instrument (CAST:PP and SCACL:TP). A copy of the schedule for one school visit by the investigator was also included in the packet.

The period during April 21, 1975, to May 16, 1975, was suggested for the administration of all the instruments. The investigator delivered more than half the packets in person to the sample teachers during his scheduled school visits (starting from April 7, 1975) before the first day of the suggested administration dates. The other packets were sent by first class mail.

The majority of the teachers were advised to return the materials to the investigator during his visits to their schools. The others were provided with sufficient postage and envelopes for returning the completed response sheets by mail. Materials were misplaced in the mail from three teachers out of a total sample of 94 teachers. The two other teachers who did not find it possible to administer the instruments were unable to do so because of the extremely low levels of vocabulary and reading comprehension of their students (a juvenile correctional institute for teen-age boys). Data from the three other teachers were not used in the analysis because of the lack of positive information on the type of their preservice program.

The *Administrator's Questionnaire* (A.Q.) and *Checklist for Assessment of Science Teachers: Supervisor's Perceptions* (CAST:SP) were mailed or delivered starting the first week of May, 1975, to the principals or other designated supervisors for the sample teachers whom the investigator met during the scheduled school visits. The completed response sheets (one DIGITEK, and one narrative, A.Q.) were returned by mail to the investigator before June 15, 1975.

Scoring

The narrative questionnaires (T.Q., S.Q., and F.C.) were coded by the investigator on DIGITEK sheets, the first three on Form 108 and the fourth on Form 129. All the DIGITEK sheets were then processed through an optical scanner at the Testing and Evaluation Center, The Ohio State University. The punched cards were obtained following the optical scanning. Each data card was identified by an eight-digit identification code representing the following:

Column 1	Type of respondent (1 = teacher, 2 = student, 3 = administrator or supervisor)
Column 2	Type of questionnaire (1 = T.Q., 2 = SCACL:TP (Pre), 3 = SCACL:TP (Post), 4 = F.C., 5 = S.Q., 6 = CAST:PP, 7 = A.Q., 8 = CAST:SP)
Columns 3,4	Teacher Identification Number
Columns 5,6	School Identification Number
Column 7	Type of school
Column 8	Type of preservice program (1 = five-quarter, $J_1 - S_2$, 2 = five-quarter, $J_1 - S_x$, 3 = SFE or ESRQ, 4 = three-quarter Post Degree, 5 = two quarters, Senior Project)

All the data cards have been stored in the office of the Faculty of Science and Mathematics Education for future use.

Other Data

Preservice scores on Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP) were obtained for the sample from the records of the Faculty of Science and Mathematics Education. These scores were collected to make a comparison between SCACL:TP (Preservice) and SCACL:TP (Inservice) scores. One preservice score per teacher was included in the analyses.

For the initial analyses of the sample versus the graduates not included in the study, the grade point averages at three stages were collected for all the secondary science teacher education graduates during the school years of September, 1969, to August, 1974. The three stages were pre-professional, professional education, and the cumulative grade point averages. The information was obtained directly from the transcripts, a copy of each of which was available in the office of the College of Education.

Selected Instruments

The instruments were selected to assess the following:

1. Changes in the teacher's perceptions about the appropriate classroom (science) activities.

2. Determination of the types of activities used in the classroom.

3. Determination of the relationship between the criterion variables and the variables from the following categories:

   A. Teacher characteristics.
   B. Student characteristics.
   C. Administrative factors.
   D. Science facilities.

Checklist for Assessment of Science Teachers (CAST)

This checklist is available in two different forms -- one for the supervisor's perceptions (CAST:SP), and the other for the pupil perceptions (CAST:PP).

The checklists were compiled in the present form by Howe and Brown (1972) at The Ohio State University. There are three separate sub-scales in the checklist which have been derived from previous works conducted by Williamson (1956), Howe (1964) at Oregon State University, Leeds and Cook (1947), and Kochendorfer (1967). The supervisor's form contains all three sub-scales, which are Teacher Pupil Relationship, Type of Classroom Activities, and Teacher's Personal Adjustment. The pupil form contains items only on the first two sub-scales. Each sub-scale consists of five questions.

The Teacher Pupil Relationship scale originated from a factor analysis of items compiled by Leeds and Cook (1947). The factors were slightly modified and reworded by Williamson (1956) and used in the Teacher Rating Scale. The scale consists of five major areas:

1. What is the status of the teacher's disciplinary ability?
2. Does the teacher have a "student" or "subject matter" point of view?
3. What is the nature of the teacher's attitude toward adolescents?
4. How does the teacher understand adolescents who have behavior problems?
5. What is the attitude of students toward this teacher?

The second sub-scale -- Types of Classroom Activities -- was developed by Brown (1972) from the Science Classroom Activity (SCACL) developed by Sagness (1970) at The Ohio State University. The SCACL contains seven sub-sections related to the types of activities in a science classroom. The scores on this checklist reflect the teacher-centered or pupil-centered nature of classroom activities. An exclusive description of SCACL is provided on page 97.

Brown (1972) carried the philosophy of SCACL in developing the section on types of classroom activities for CAST, and encompassed it into the following five major areas:

1. What do students do in the teacher's class?
2. What is the role of the teacher in the classroom?
3. How does the teacher use the textbook and reference materials?
4. How are the teacher's tests designed, and how are they used?
5. How does the teacher conduct the laboratory?

The third sub-scale -- Teacher's Personal Adjustment -- was designed originally by Williamson (1956) for the Teacher Rating Scale, and later used by Howe (1964). It was divided into five areas:

1. Is the teacher capable of analytical thinking?
2. What are the social attitudes of the teacher?
3. What emotional attitudes are shown by the teacher?
4. To what extent does the teacher develop satisfactory personal relationships?

Each of the major areas in the three sub-scales was divided into five parts. Each of the parts reflected a teacher's attitude toward the major area, ranging from most desirable to least desirable. A numerical scoring key, assigning weights of 5, 4, 3, 2, 1 to successive parts in each area was used by earlier investigators as well as in this study. Thus a score of 25 reflected the most desirable attitude and types of classroom activities performed by a teacher. A score of five reflected the least desirable attitude and type of classroom activities. The maximum possible score was 75 for the CAST:SP and 50 for the CAST:PP.

Brown (1972) observed that extremely careful attention was given the readability of the pupil's form. The Dale and Chall (1948) and the Flesch (1949) tests of readability were conducted and the respective scores were converted to grade level seven and grade level five-six.

Best (1970) reported some of the unpublished results based on the data collected by Howe at The Ohio State University. The data were collected on the Teacher Pupil Relationship sub-scale in Oregon and at The Ohio State University. Table 12 containing ranges, means, and reliability estimates is reproduced from Best's report (1970) with prior approval of Howe.

TABLE 12

RANGES, MEANS AND RELIABILITIES OF TEACHER-PUPIL RELATIONSHIP RATINGS AS REPORTED BY BEST (1970, p. 78)

Teachers	Raters	Mean	Range	Reliability (KR 20)
30 Biology Teachers in Oregon Schools	Principal or Supervisor	18.2	10-25	.84
(1967)	10th Grade Students	16.9	10-24*	.86
120 Student Teachers (Biology) at The Ohio State University	Cooperating Teachers	16.6	8-25	.85
40 of the Above	10th Grade Students	16.3	10-24*	.81

*Rounded to the nearest whole number.

Best (1970) administered the Teacher Pupil Relationship sub-scale to 308 classroom students and reported Hoyt's reliability as .82.

Brown (1972) reported correlations between SCACL:TP and different sub-scales as well as composite scores on CAST:SP and CAST:PP. These are reported in the following table (13).

TABLE 13

SIGNIFICANT CORRELATIONS BETWEEN SCACL:TP (URBAN SCHOOLS) AND CAST AS REPORTED BY BROWN (1972, pp. 117-118)

Score Description	Number of Subjects (N)	Correlation Coefficients (r)	Level of Significance
CAST:SP (Types of Activities) by University Supervisors	46	.403	.01
CAST:SP (Composite) by University Supervisors	46	.360	.05
CAST:SP (Teacher Pupil Relationship) by University Supervisors	45	.313	.05
CAST:PP (Types of Activities) on Student Teachers	6	.933	.01
CAST:PP (Teacher Pupil Relationship) on Student Teachers	6	.944	.01
CAST:PP (Composite) on Student Teachers	6	.909	.05

Correlations of CAST:SP and CAST:PP with SCACL:TP obtained in this study are reported in Table 14. The sample for SCACL:TP included 89 secondary science teachers. Sample numbers for CAST:SP and CAST:PP are presented within the table.

TABLE 14

CORRELATIONS OF SCACL:TP WITH CAST:SP AND CAST:PP

Score Description	Number of Subjects (N)	Correlation Coefficients (r)	Level of Significance
CAST:SP - Sub-Scale A (Teacher Pupil Relationships)	86	0.316	.05
CAST:SP - Sub-Scale B (Type of Classroom Activities)	86	0.198	.05
CAST:SP - Sub-Scale C (Teacher's Personal Adjustmant)	86	0.340	.001
CAST:SP (Composite)	86	0.329	.001
CAST:PP - Sub-Scale A (Teacher Pupil Relationships)	86*	0.356	.001
CAST:PP - Sub-Scale B (Type of Classroom Activities)	86*	0.304	.05
CAST:PP (Composite)	86*	0.402	.001

*Number of subjects indicates average scores obtained from a total of 1,986 student responses categorized according to teachers.

Brown reported the reliability estimates for CAST:PP. KR-20 and KR-21 estimates were 0.74 and 0.71 for CAST:PP using a sample of 327 high school students.

CAST:PP and CAST:SP were administered to 1,986 students and 86 administrators and science supervisors. Estimates of Hoyt's reliabilities were calculated by using the FORTAP (RAVE) computer program developed by Dan Bauman (1973).

Because of the limitation of the computer program (maximum 1,000 subjects), a random sample of 994 CAST:PP responses was drawn from the total responses for computing the reliability. Hoyt's reliability estimates are presented in Tables 15 and 16 By using the particular computer program new response choices for each item were generated that produced the optimum estimates for Hoyt's reliabilities. These new choices and other relevant data generated are presented in Appendix F.

TABLE 15

HOYT'S RELIABILITY ESTIMATES FOR CAST:SP

Source	DF	MEAN SQ.	F	R and SE
Individuals	85	5.1863	9.9701	0.8997
Items	14	5.2126	10.0206	2.6986
Error	1190	0.5201		
Total	1289			

TABLE 16

HOYT'S RELIABILITY ESTIMATES FOR CAST:PP

Source	DF	MEAN SQ.	F	R and SE
Individuals	993	4.7982	4.4231	0.7739
Items	9	78.4913	72.3561	3.1246
Error	8937	1.0847		
Total	9939			

Science Classroom Activity Checklist: Teacher's Perceptions

The checklist was developed by Howe and Sagness (1970) as an extension of the work completed by Kochendorfer (1967) in developing the *Biology Classroom Activity Checklist* (BCAC) at the University of Texas. The checklist is a collection of 60 True/False type items which represent seven dimensions of a classroom. These are student classroom participation, role of the science teacher in the classroom, use of textbook and reference materials, laboratory preparation, type of laboratory activities, design and use of tests, and laboratory follow-up activities. A composite score on this checklist reflects the degree to which a teacher uses activities thought to achieve the objectives of contemporary inquiry-oriented science courses. A high score on the checklist (true answers) reflects positive activities for the accomplishment of inquiry-oriented objectives.

Sagness (1970) piloted various forms of this checklist and calculated their reliability and validity estimates. Further, Brewington (1971) Cignetti (1971), and Brown (1972) used this checklist for evaluating the different aspects of the preservice teacher education program at The Ohio State University. This investigator administered the checklist to sample teachers. The reliability estimates from all these studies, except Brown, are presented in Table 17.

TABLE 17

THE KUDER-RICHARDSON-20 AND KUDER-RICHARDSON-21 RELIABILITY ESTIMATES FOR THE SCIENCE CLASSROOM ACTIVITY CHECKLIST (TEACHER'S PERCEPTIONS) FROM DIFFERENT SOURCES

Type of Subjects (and Name of the Study)	Number of Subjects	KR-20	KR-21
1. Urban - Suburban Combined (Sagness)	38	.841	.812
2. Urban (Sagness)	62	.745	.704
3. Suburban (Sagness)	62	.800	.763
4. Urban - Suburban Combined (Brewington)	26	.728	
5. Ohio State and Non-Ohio State Graduates (Cignetti)	45	.65	.64
6. Present Study	88	.705	.656

Facilities Checklist

The purpose of using this checklist was to seek information regarding the status of physical facilities, equipment and other provisions available for the teaching of science in schools.

This checklist was based on an earlier form of a similar checklist developed and used by Cignetti (1971) and Brewington (1971) in association with Schlessinger and Howe at The Ohio State University. The earlier version was prepared after reviewing materials published by Chemical Educational Materials Study (CHEM Study), Physical Science Study Committee, Biological Sciences Curriculum Study (BSCS) and National Science Teachers Association groups. There were six different categories included in the checklist. These were room design, fixed laboratory facilities, laboratory equipment, laboratory assistants, budget considerations, and field trips. A total of 46 questions were included in the original form.

The form of Facilities Checklist used in the present study was a shorter form (24 items). The items which showed no significant correlations with the criterion variables (SCACL:TP) in the past two studies were eliminated from the revised form. However, all the six categories were represented in the shorter version.

The sample teachers completed this checklist on a three-choice (No/Yes/Outstanding) scale. The items were coded on DIGITEK sheets and transferred on unisort computer cards for further analysis. A copy of the checklist appears in Appendix C.

Administrator's Questionnaire

It was hypothesized during the inception of this study that school administrators who came in contact directly with science teachers might influence some of the practices used by teachers. Such a contention has been substantiated in the literature (Peruzzi, 1972).

This questionnaire was developed by the investigator to seek the administrator's or supervisor's views regarding the purposes and teaching methodology for science instruction, the attitude toward student discipline, the attitude toward students causing problems, and the perception of their role for instructional leadership.

The first six items covered biographical information. Items seven and eight were concerned with the purposes and teaching methodology for science teaching. These two items were in the form of a rank order checklist. The next seven items were taken from the Science Supervisory Style Inventory (SSSI) developed by Peruzzi (1972). The SSSI was based on the psycho-sociological model -- The Social Systems Model -- developed by Getzels and Guba (1955). The question items taken for the present study belonged to the factors with over 0.7 factor loadings identified by Peruzzi (1972).

The last four questions in the Administrator's Questionnaire were in common with the Teacher Questionnaire. This was done to make a comparative check on what an administrator thinks he/she should be doing in the area of instructional leadership against what he/she does as perceived by the sample teachers.

Teacher Questionnaire

The Teacher Questionnaire (T.Q.) used in this study was somewhat similar to the one developed and used by Brewington (1971) and Cignetti (1971). Certain new items were added by the investigator covering areas such as the attitude of teachers toward the meeting time of the class used in the study, grading and reporting, level of the class, and the items used in the Administrator's Questionnaire. The seven questions based on the factor leadings obtained by Peruzzi (1972) were to seek the teacher's expectations as well as the actual status of instructional leadership provided by administrators.

The responses were coded on a DIGITEK sheet and transferred to unisort computer cards. The common items between A.Q. and T.Q. were assigned a numerical score of four for the most desirable (response choice A) to the least desirable (response choice D).

Student Questionnaire

The Student Questionnaire (S.Q.) was based on the earlier version used by two investigators, Brewington (1971) and Cignetti (1971). The questionnaire was designed to provide information on student characteristics such as age, sex, number of years of science, previous grades, attitudes toward the teacher and the science course, and future plans for pursuing a science related career. Three additional items were included to seek further information on students' views -- if he/she dislikes the science course as taught by the science teacher and why, if he/she is not interested in a science related career and why, and who most influenced him/her to pursue a science related career, if, in fact, he/she does plan to do that.

The responses were coded on a DIGITEK sheet by the investigator and transferred to unisort computer cards.

CHAPTER IV

THE RESULTS

The purpose of this study was to evaluate selected aspects of the preservice secondary science teacher education program at The Ohio State University. A total of nine specific hypotheses were proposed concerned with the views of science teachers (program graduates) regarding the type of classroom activities they should use as well as the type they actually did use.

A large number of independent variables relating to teacher, student, administrative, and situational characteristics were examined to determine their relationship to criterion variables. The methodology adopted was to follow up one- to five-year graduates who were teaching in Ohio during 1974-75 and administer a battery of instruments to their students, their supervisors, and themselves.

This chapter presents the results of the data collected. There are three major sections included. In the first section, data analysis is presented concerning changes in views of science teachers, from preservice to present, regarding appropriate classroom activities. Preservice and inservice scores on this aspect were collected by administering SCACL:TP. Data were analyzed by one-way analysis of variance.

The second section deals with the determination of the type of classroom activities actually implemented by science teachers in their classrooms. The data for this aspect were collected by administering CAST:SP and CAST:PP to administrators and students in a single class in each school. The data obtained were grouped according to length of teacher's teaching experience, type of schools of current employment, teacher's major field of preparation, and different versions of the preservice program. Analysis of data was performed by analysis of variance.

The third section is devoted to identification of variables to predict the views of science teachers regarding appropriate classroom activities and type of activities actually implemented. The variables were drawn from four categories -- teacher related, student related, administrative and situational. Data for these were collected by administering Teacher's Questionnaire (T.Q.), Student's Questionnaire (S.Q.), Administrator's Questionnaire (A.Q.) and Facilities Checklist (F.C.). Analysis of data was performed by stepwise multiple regression on all the independent variables. This was followed by factor analysis of all the independent variables to examine how predictor variables loaded on different factors. A summary is presented for each major section.

Change in Views of Science Teachers Regarding Appropriate Science Classroom Activities

The Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP) was administered to teachers during their preservice teacher education program and their inservice during the course of this study. Preservice scores were retrieved from the records available in the office of the Faculty of Science and Mathematics Education. A composite score on SCACL:TP (Preservice) was available for only 65 sample teachers, which included none for 1969-70, 8 for 1970-71, 10 for 1971-72, 18 for 1972-73, and 19 for 1973-74 school years.

Inservice SCACL:TP scores were obtained by administering the instrument during Spring, 1975. There were 86 responses returned. However, the responses of only 65 participants with both preservice and inservice scores were used for determining changes in their views.

The data were grouped according to length of teaching experience, type of school of current employment, and version of preservice program. Means and standard deviations on SCACL:TP for each preservice and inservice group are presented in Tables 18, 19, and 20. For the group according to teaching experience the ranges of preservice mean scores on SCACL:TP was 49.44 to 54.66 and that of inservice mean scores between 51.16 and 54.44.

TABLE 18

MEANS AND STANDARD DEVIATIONS OF SCACL:TP PRESERVICE AND INSERVICE SCORES ACCORDING TO LENGTH OF TEACHING EXPERIENCE

Years of Experience*	N	Preservice Mean	Preservice S.D.	Inservice Mean	Inservice S.D.
1	19	49.44	4.07	54.44	3.48
2	18	54.66	2.30	51.16	12.11
3	10	54.60	3.02	54.20	3.76
4	18	53.15	2.89	51.73	4.38

*Preservice scores for sample teachers with five years of full-time teaching experience were not available.

TABLE 19

MEANS AND STANDARD DEVIATIONS OF SCACL:TP PRESERVICE AND INSERVICE SCORES ACCORDING TO TYPES OF SCHOOLS

Types of School (By Grades)	N	Preservice		Inservice	
		Mean	S.D.	Mean	S.D.
6-8	12	54.08	3.72	53.00	4.28
7-8	5	53.20	2.38	52.20	5.26
7-9	17	51.05	3.92	54.00	3.95
10-12	6	53.00	3.22	53.66	3.82
9-12	23	53.43	3.88	51.52	10.87
9	2	50.00	1.41	52.00	1.4.
Correctional	1	48.00		52.00	

TABLE 20

MEANS AND STANDARD DEVIATIONS ON SCACL:TP

PRESERVICE AND INSERVICE SCORES

ACCORDING TO VERSIONS OF

PRESERVICE PROGRAMS

Program Versions	N	Preservice Mean	Preservice S.D.	Inservice Mean	Inservice S.D.
Senior Project	17	53.81	2.94	52.43	4.32
J_1 - S_2	30	52.71	4.09	52.42	9.83
J_1 - S_x	5	49.40	4.72	56.60	2.30
ESRQ, SFE	8	53.12	2.29	51.87	4.42
Post Degree	5	52.60	4.15	53.00	5.78

For the group according to school types the range of scores for preservice was 48.0 to 54.0, the lowest obtained by a teacher in a correctional school for girls and the highest by middle school (sixth, seventh and eighth grades) teachers. Inservice scores arranged according to type of schools ranged from 51.5 to 54.0.

For the group according to program version the range of SCACL:TP mean scores was 49.4 to 53.8 for preservice scores, the lowest being in the $J_1 - S_x$ program and the highest in the Senior Project. However, these scores changed during inservice, with a range of 51.8 to 56.6, the lowest obtained by ESRQ and SFE teachers and the highest by $J_1 - S_x$ teachers. The students in the $J_1 - S_x$ program were deemed the better prepared. They were involved in student teaching without an S_1 experience.

Further analysis was performed by analysis of variance using the change scores on SCACL:TP from preservice to inservice. One teacher, employed in the correctional school for girls, was not included in this analysis. The curriculum and the educational setting were considerably different in the correctional school from a typical high school. Preservice SCACL:TP scores for teachers with five years of teaching experience were not available. Consequently, these teachers were excluded from all analyses concerning changes in their views.

Results of analysis of variance are presented in Table 21 according to length of teaching experience. To be significant at the .05 level the F-ratio with degrees of freedom 3 and 61 should be equal to or greater than 2.75. The F-ratio obtained in the analysis was 1.514, thus no significant differences were found in the changes that occurred on SCACL:TP scores from preservice to inservice for teachers with one to four years of teaching experience.

TABLE 21

ANALYSIS OF VARIANCE ON CHANGES IN PRESERVICE TO INSERVICE SCACL:TP SCORES ACCORDING TO DIFFERENT GROUPS

Length of Teaching Experience*

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	92.6721	3	30.8907	1.5145	N.S.
Within groups	1244.1880	61	20.3965		
Total	1336.8599	64			

*Data for one teacher employed in correctional school not included

Type of Schools of Current Employment*

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	71.6759	5	14.3352	0.6685	N.S.
Within groups	1265.1841	59	21.4438		
Total	1336.8600	64			

*Data for one teacher employed in correctional school not included

TABLE 21 (CONTINUED)

Different Versions of Preservice Programs

Source	Sum of Squares	D.F.*	Mean Square	F-ratio	Significance
Between groups	50.3456	4	12.5864	0.5740	N.S.
Within groups	1306.7100	60	21.9285		
Total	1357.0556	64			

*Data for one teacher employed in correctional institute not included

Table 21 presents an analysis of variance data for different school types. To be significant at the .05 level, the F-ratio with degrees of freedom 5 and 59 should be equal to or greater than 2.36. The actual F-ratio obtained was 0.6685. Thus no significant differences were found in changes that occurred on SCACL:TP mean scores for teachers in different types of schools.

Data on analysis of variance for the group arranged according to program versions are presented in Table 21. To be significant at the .05 level, the F-ratio with 4 and 60 degrees of freedom should be equal to or greater than 2.52. The actual F-ratio obtained was 0.5740 to indicate no significant differences in mean scores.

To summarize, data on SCACL:TP were obtained during the preservice program and again during inservice. Changes in mean scores from preservice to inservice were computed. Analysis of variance revealed that the changes in scores on SCACL:TP were non-significant when teachers were grouped according to length of their teaching experience (one to four years), type of schools of employment, or different versions of the preservice program provided.

Hypothesis 1 as specified in Chapter I related to this finding. It was stated as: The secondary science teachers graduated from The Ohio State University have not significantly *changed their views regarding appropriate type of classroom activities during their teaching careers in schools*. The results of this analysis showed that the changes in teachers' views as measured by SCACL:TP were not significant. Therefore, Hypothesis 1 cannot be rejected.

The implication of this analysis is that science teachers graduated from the field-based program held almost the same views regarding appropriate types of classroom activities after one to four years of teaching experience as during their preservice education.

Determination of Type of Classroom Activities Implemented

The data were collected to determine the type of activities implemented by teachers from sub-score B on CAST:SP and CAST:PP. Student's responses were converted to a mean class score for each sample teacher. The data from both forms of the checklist were grouped into four separate categories for analysis. These groups were formed according to the length of teaching experience of teachers, type of schools, field of instructional specialization, and the different versions of preservice programs.

A maximum possible score on sub-scale B on two CAST forms was 25, which suggests in general a considerable amount of student-oriented instruction. On the contrary, a score closer to a minimum score of five indicates that most activities, including laboratory experiments, use of textbooks and reference materials, and the tests are organized in such a way that students' active involvement and independence in carrying out investigations becomes secondary in importance.

Analyses were performed separately for each group using one-way analysis of variance. Means and standard deviations for the two forms of the checklist are presented for lengths of teaching experience, type of schools, major field of specialization, and preservice program versions respectively in Tables 22, 23, 24, and 25. The range of means according to teaching experience scores obtained on CAST:SP-B were 19.7 to 22.1, and 17.6 to 18.5 on CAST:PP-B. Mean scores for the group arranged according to school types ranged from 18.0 to 22.5 on CAST:SP-B and from 16.5 to 18.3 on CAST:PP-B. The teachers with different fields of specialization varied in the mean scores on CAST:SP-B from 19.9 to 21.4 and on CAST:PP-B from 17.5 to 18.8. The mean scores for the group according to program versions ranged from 20.0 to 21.6 on CAST:SP-B and from 17.1 to 19.2 on CAST:PP-B.

It may be observed that scores on CAST:SP-B are consistently higher than on CAST:PP-B. This shows that administrators rate activities in classrooms to be more inquiry-oriented than do classroom students. An implication of this might be the administrator approval and support of the teacher's instructional strategy. Analyses to show this are explained under the subsection "Identification of Predictor Variables" in this chapter.

The mean scores of inservice teachers on CAST:SP (subscores A and B) were 40.94 (N = 86) as compared to 38.67 (N = 39) reported by Brown (1972) in his study on project preservice teachers. He did not report means for CAST:SP-C. Brown (1972) reported composite mean scores on CAST:PP-B for project preservice teachers (N = 9) as 39.78 as compared to 37.30 (N = 86 classrooms or 1986 individual responses). (Appendix H)

TABLE 22

MEANS AND STANDARD DEVIATIONS ON THE TYPE OF CLASSROOM ACTIVITIES ASSESSED BY CAST:SP-B AND CAST:PP-B ACCORDING TO LENGTHS OF TEACHING EXPERIENCE

Years of Experience	N	CAST:SP-B		CAST:PP-B*	
		Mean	S.D.	Mean	S.D.
1	20	20.42	3.76	17.90	2.61
2	21	20.80	3.35	17.85	2.19
3	19	19.94	3.58	18.52	1.77
4	18	19.77	2.88	17.72	1.63
5	8	22.10	2.60	17.62	2.13

*Based on class mean scores.

TABLE 23

MEANS AND STANDARD DEVIATIONS ON THE TYPE OF CLASSROOM ACTIVITIES ASSESSED BY CAST:SP-B AND CAST:PP-B ACCORDING TO TYPE OF SCHOOLS

Type of School (Grades)	N	CAST:SP-B		CAST:PP-B*	
		Mean	S.D.	Mean	S.D.
6 - 8	13	20.38	3.04	17.92	2.21
7 - 8	5	18.40	4.15	17.60	1.81
7 - 9	21	21.04	3.10	18.15	1.87
10 - 12	10	21.40	2.17	18.30	1.76
9 - 12	34	20.11	3.76	18.08	2.23
9	2	22.50	2.12	16.50	2.12
Correctional	1	18.00		17.0	

*Based on class mean scores.

TABLE 24

MEANS AND STANDARD DEVIATIONS ON THE TYPE OF CLASSROOM ACTIVITIES ASSESSED BY CAST:SP-B AND CAST:PP-B ACCORDING TO FIELD OF SPECIALIZATION

Major		CAST:SP-B		CAST:PP-B*	
Field	N	Mean	S.D.	Mean	S.D.
Biological Sciences	35	19.94	3.50	17.94	2.20
Comprehensive/ General Science	30	20.86	2.60	17.56	2.26
Earth Science	9	21.44	3.94	18.22	1.30
Physical Sciences	12	20.25	4.04	18.83	1.52

*Based on class mean scores.

TABLE 25

MEANS AND STANDARD DEVIATIONS ON THE TYPE OF CLASSROOM ACTIVITIES ASSESSED BY CAST:SP-B AND CAST:PP-B ACCORDING TO PRESERVICE PROGRAM VERSIONS

Program Versions	N	CAST:SP-B Mean	CAST:SP-B S.D.	CAST:PP-B* Mean	CAST:PP-B* S.D.
$J_1 - S_2$	30	20.03	3.24	17.93	2.01
$J_1 - S_x$	5	20.80	2.77	19.25	3.40
ESRQ, SFE	10	21.60	3.74	18.50	1.50
Post-Degree	10	20.77	3.30	17.10	2.99
Senior	31	20.43	3.55	17.89	1.8.

*Based on class mean scores.

TABLE 26

ANALYSIS OF VARIANCE ON CAST:SP-B AND CAST:PP-B ACCORDING TO LENGTH OF TEACHING EXPERIENCE

CAST:SP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	42.605	4	10.651	0.958	N.S.
Within groups	900.788	81	11.121		
Total	943.393	85			

CAST:PP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	8.301	4	2.075	0.466	N.S.
Within groups	360.594	81	4.452		
Total	368.895	85			

The F-ratio, to be significant at the .05 level for 4 and 81 degrees of freedom, should be equal to or greater than 2.49. The actual F-ratios, 0.958 and 0.466, do not meet this requirement, and are therefore not significant. (Table 26) This meant that teachers with more experience (up to five years) and teachers with less experience utilized similar types of activities in the classroom.

TABLE 27

ANALYSIS OF VARIANCE ON CAST:SP-B AND CAST:PP-B ACCORDING TO TYPES OF SCHOOLS OF EMPLOYMENT

CAST:SP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	49.588	5	9.918	0.883	N.S.
Within groups	887.658	79	11.236		
Total	937.246	84			

CAST:PP-B

Source	Sum of Squares	D.F.*	Mean Square	F-ratio	Significance
Between groups	6.885	5	1.377	0.320	N.S.
Within groups	340.432	79	4.308		
Total	347.327	84			

*One teacher employed in a correctional school not included.

The F-ratio, to be significant at .05 level for 5 and 79 degrees of freedom, should be equal to or greater than 2.33. The actual F-ratio values were lower, 0.883 and 0.320, than the critical value. Therefore the differences in CAST:SP-B and CAST:PP-B according to school types scores were not significant. (Table 27) In other words, teachers employed in different types of schools implemented similar types of activities.

TABLE 28

ANALYSIS OF VARIANCE ON CAST:SP-B AND CAST:PP-B ACCORDING TO MAJOR FIELD OF SPECIALIZATION

CAST:SP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	23.5711	3	7.8570	0.7004	N.S.
Within groups	919.8223	82	11.2173		
Total	943.3933	85			

CAST:PP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	14.4207	3	4.8069	1.1120	N.S.
Within groups	354.4741	82	4.3229		
Total	368.8948	85			

To be significant at the .05 level, F-ratio for 3 and 82 degrees of freedom should be equal to or greater than 2.73. Neither of the two values, 0.7004 and 1.1120, complete this requirement. Hence the differences between CAST:SP-B and CAST:PP-B scores are not significant for different fields of specialization. (Table 28) This meant that science teachers, regardless of their specialization, implemented similar types of activities.

TABLE 29

ANALYSIS OF VARIANCE ON CAST:SP-B AND CAST:PP-B ACCORDING TO VERSIONS PRESERVICE PROGRAM

CAST:SP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	19.899	4	4.975	0.429	N.S.
Within groups	940.329	81	11.609		
Total	960.228	85			

CAST:PP-B

Source	Sum of Squares	D.F.	Mean Square	F-ratio	Significance
Between groups	17.099	4	4.275	0.963	N.S.
Within groups	359.559	81	4.439		
Total	376.658	85			

To be significant at the .05 level, the F-ratio for 4 and 81 degrees of freedom should be equal to or greater than 2.49. Both the ratios, 0.429 and 0.963, obtained in this analysis are below the critical value and are not significant (Table 29). This meant that graduates from different versions of preservice programs implemented similar types of activities.

To summarize there were four different hypotheses related to the determination of activities actually implemented by science teachers.

Hypothesis 2 was stated as: There is no significant difference in the types of science classroom activities used in the schools by program graduates with different amounts of full-time teaching experience. From the analysis of the variance (Table 26) it can be seen that non-significant F-ratios are obtained. Hypothesis 2 is not rejected.

Hypothesis 3 was stated as: There is no significant difference in the types of science classroom activities used by program graduates employed in different types of schools. There were six different types of schools, depending on different combinations of grades 7 through 12 where graduates were employed in the school year 1973-74. The actual values of F-ratios (Table 27) obtained were lower than the critical value. This suggested that mean differences on type of activities implemented by teachers in schools with different grade combinations were not significant. Hypothesis 3 is not rejected.

Hypothesis 4 concerning the type of classroom activities was stated as: There is no significant difference in the types of science classroom activities used by graduates with different fields of their main instructional specialization. Table 28 shows the results of analyses of variance on types of classroom activities implemented by teachers with different areas of specialization (at the preservice level). The F-ratios for CAST:SP-B and CAST:PP-B were found non-significant at the .05 level. Hypothesis 4 was not rejected.

Hypothesis 5 concerning different versions of the preservice program was stated as: There is no significant difference in the types of science classroom activities used by graduates who received their education in different versions of the preservice teacher education program. Sub-score B on two forms of CAST were compared to the type of preservice program. Non-significant F-ratios were obtained (Table 29). Hypothesis 5 was not rejected.

It can be observed from this analysis that, based on feedback from students and administrators, science teachers graduated from the field-based program in different years, with different specializations of teaching, and obtaining their training in different versions of the program, were quite similar in type of activities implemented in the classroom. The type of school of employment also did not alter this conclusion. A significant correlation (r = .3041) between CAST:PP-B and SCACL:TP further suggests that activities implemented in classrooms were student-centered and inquiry-oriented in nature.

Identification of Predictor Variables

An objective outcome of this study was to identify certain independent variables which have a strong power to predict the scores on criterion variables. Two criterion variables used in the study were the teacher's views regarding appropriate classroom activities and the type of activities actually implemented. Independent variables were drawn from four areas -- teacher characteristics, student characteristics, administrative variables and situational variables. Four different hypotheses (6, 7, 8, and 9) were formulated which relate to the independent variables in the four areas mentioned.

Information on various independent variables was collected by administering Teacher's Questionnaire (T.Q.), Student's Questionnaire (S.Q.), Administrator's Questionnaire (A.Q.), Facilities Checklist (F.C.), sub-scores A and C of Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP), and sub-score A of Checklist for Assessment of Science Teachers: Pupil Perceptions (CAST:PP). Data on criterion variables were collected from Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP), and sub-score B on both CAST:SP and CAST:PP. For a limited purpose to identify predictor variables from a large number of independent variables composite scores on CAST:PP and

CAST:SP were also entered in the analysis as criterion variables.

Statistical procedures involved in the analysis of variables included Pearson Product Moment Correlation and stepwise multiple regression. An additional procedure, factor analysis, was used to gain additional information regarding the relationship of independent variables.

The discussion in this section is organized in the following sequence. First, the results of stepwise multiple regression using independent variables will be described. Second, the results of factor analysis will be included. Third, a discussion of the findings from these two analyses will be presented.

Multiple Regression by Using Independent Variables

The data were collected on a total of 119 teacher, student, administrator and situational independent variables and five criterion variables. A list of these variables is included in Appendix B. Raw scores for each variable were punched on unisort computer cards for further analysis.

The first step was to compute correlation coefficients for all the independent and criterion variables by using the BMDO2D program. A 124 x 124 correlation matrix was obtained, which is included in Appendix G. This analysis resulted in the identification of important independent variables with a potential contribution for predicting the criterion variables.

In the second stage a selection of 73 to 77 variables for each criterion variable was made based on their correlation coefficients. This step was necessitated by the limitation imposed on the maximum number of variables (80) used by the BMDO2R program for stepwise regression analysis (Appendix A). The criterion used for the selection of variables was to include those variables which showed the highest correlation coefficients. This resulted in including all the variables in the analysis having correlation coefficients (r) greater than or equal to +.02 or -.02.

Stepwise regression analysis was performed using independent variables directly. Separate analyses were performed using the CAST:PP-B, CAST:PP (Composite), CAST:SP-B, CAST:SP (Composite), and SCACL:TP scores as criterion variables. For each criterion variable two different stepwise regression analyses were performed. The first set of analyses was performed by using all the independent variables including the CAST:PP-A, CAST:SP-A, and CAST:SP-C sub-scores. The analyses showed that CAST sub-scores accounted for 20 to 50 percent of the variances.

The second set of analyses was performed then without the CAST:PP-A, CAST:SP-A and CAST:SP-C sub-scores. This resulted in the identification of many additional variables which entered prediction equation.

Best predictors for the CAST:PP (Composite) and CAST:SP (Composite) were their sub-scores (CAST:PP-A, CAST:SP-A, and CAST:SP-C), which is expected. In order to avoid any inflated claims regarding the prediction power of these sub-scores, the tables are presented here for the CAST:PP (Composite) and CAST:SP (Composite) as criterion variables, using only the second set of analyses, that is, without the three sub-scores on CAST:PP and CAST:SP. Both sets of regression analyses results are presented for the CAST:PP-B and CAST:SP-B and SCACL:TP as criterion variables.

1. CAST:PP-B as Criterion Variable. Stepwise multiple regression using 73 independent variables (with highest correlation coefficients) and CAST:PP-B as the criterion variable was performed with and without CAST:PP-A, CAST:SP-A, and CAST:SP-C. Results of the analysis with the inclusion of CAST sub-scores are presented in Table 30. The best predictor variable entering in the equation at the first step was the CAST:PP-A (teacher pupil relationship). It accounted for 31 percent of the variance. Variable number 108 (funds for perishables, glassware, chemicals, and specimens) entered the prediction equation at step two for an additional 16 percent of the variance. Next, three variables, 79, 77, and 73, covering the administrator's views regarding the most appropriate teaching strategies for science (programmed instruction, laboratory investigations, and lecture/discussion) appeared at steps three, four, and five for an additional 12 percent of the variance.

In the second stepwise regression, that is, without CAST sub-scores, as presented in Table 31, four new variables entered the prediction equation within the first five steps. Variable 42 at first step was a student related variable (Do you enjoy assignments in this class?) and was responsible for 19 percent of the variance. Variables 108 and 93 (funds for perishables, glassware and chemicals, and storage space) were covering physical facilities and appeared at steps two and three. These variables accounted for 15 percent and 8 percent of the variance respectively. Variable 28 (teacher's views of administrator's help concerning the use of variety and balance in instructional techniques) entered the equation at step four for 5 percent of the variance. Level of class-modified, which is variable 34, appeared at step five for an additional 4 percent variance. The sign of the coefficient was negative for variable 34.

From this it seems that two very strong dimensions among predictor variables are emerging. Two variables (student's liking for the science course, 42, and teacher pupil relationship as perceived by pupils, 117), both appearing on step one, suggest an extremely important dimension of student characteristics. These two variables are significantly correlated (0.5877), which further substantiates this result. Similarly, variables related to school facilities (108 and 93) appearing at steps two and three indicate another dimension of the situational variable.

TABLE 30

REGRESSION ANALYSIS: CAST:PP-B AS CRITERION VARIABLE (ALL INDEPENDENT VARIABLES)

Step No.		Variable Entered-Removed	Sign of Coefficient (R)	Multiple R	RSQ	Increase in RSQ
1	117	CAST:PP-A (Teacher-Pupil Relationship)	+	0.5572	0.3104	0.3104
2	108	Funds for Perishables	+	0.6834	0.4671	0.1567
3	79	Programmed Instruction (Administrator's Views)	+	0.7199	0.5182	0.0511
4	77	Laboratory Activities (Administrator's Views)	+	0.7415	0.5498	0.0316
5	73	Lecture/Discussion (Administrator's Views)	+	0.7662	0.5870	0.0372

TABLE 31

REGRESSION ANALYSIS: CAST:PP-B

AS CRITERION VARIABLE

(OTHER CAST SCORES EXCLUDED)

Step No.		Variable Entered-Removed	Sign of Coefficient (R)	Multiple R	Multiple RSQ	Increase in RSQ
1	42	Student's Liking for Assignments	+	0.4352	0.1894	.1894
2	108	Funds for Perishables	+	0.5867	0.3442	.1549
3	93	Storage Space	+	0.6488	0.4210	.0768
4	28	Teacher's Views of Administrator's Help Concerning Instructional Techniques	+	0.6875	0.4727	.0517
5	34	"Modified" Class	-	0.7143	0.5102	.0375

2. CAST:PP (Composite) as Criterion Variable. Table 32 shows the results of stepwise regression analysis with all independent variables except CAST sub-scores and using CAST:PP (Composite) as criterion variable. Variable 41 entered the prediction equation at step one and referred to the student's liking of the particular course taught by the sample teacher. This variable accounted for 34 percent of variance. The other variables entering at steps two, three, four, and five, and their variances respectively, were student's final grade in last science course (7 percent), teacher's feeling toward curriculum materials used (5 percent), student's liking for assignments (6 percent), and student's sex (4 percent).

The results indicate that student characteristics expressed in terms of liking the course, last final grade in science, and liking assignments are very important to consider, when assessment of a teacher is made based on the CAST:PP (Composite) score. The other variable with less degree of predictive power is concerned with how a teacher feels about the curriculum materials.

TABLE 32

REGRESSION ANALYSIS: CAST:PP (COMPOSITE) AS CRITERION VARIABLE

(OTHER CAST SCORES EXCLUDED)

Step No.		Variable Entered-Removed	Sign of Coefficient (R)	Multiple		Increase in RSQ
				R	RSQ	
1	41	Student's Liking for "This" Science Course	+	0.5847	0.3419	0.3419
2	39	Student's Final Grade in Last Science Course	+	0.6451	0.4161	0.0742
3	14	Teacher's Feeling Toward Curriculum Materials Used	+	0.6874	0.4726	0.0564
4	42	Student's Liking for Assignments	+	0.7264	0.5277	0.5551
5	37	Student's Sex (female)	+	0.7504	0.5632	0.0354

3. CAST:SP-B as Criterion Variable. The stepwise multiple regression analysis with all independent variables and CAST:SP-B as criterion variable revealed CAST:SP-A as the most important single variable, accounting for 43 percent of the variance (Table 33). Variable eight, teacher's exposure to science curriculum projects, entered the equation on second step and contributed an additional 4 percent of the variance. Step three focused on a facilities related variable, 99 (presence of electrical outlets). This variable added 3 percent variance. CAST:SP-C entered the equation at step four for 2 percent of the variance.

In the second stepwise regression, new variables appeared except for the facility variable 99, which is in common with the first analysis (Table 34). The first step variable,9, was related to the number of curriculum workshops attended by sample teachers. This variable accounted for 7 percent of the variance. Variable 25, teacher's perceptions of the type of support given him/her by the school administration entered the prediction equation on step two and accounted for an additional 7 percent of the variance. The step three variable, 99, contributed slightly more (4 percent) variance in this analysis as compared to the previous one (Table 33). Variable 18, teaching periods per day, and variable 109, laboratory assistants assigned, entered at steps four and five, adding 8 percent of the variance.

This analysis lends further support to the results of earlier analyses on CAST:PP. Teachers who have had experience with new curriculum materials are rated high by supervisors on CAST:SP-B sub-scale. Similarly, the variables related to science facilities discussed in earlier analyses are found to be important predictors. Administrative variable 25 (teacher's views on actual support given by administration) appears high at step two, and goes along with other administrative variables appearing on CAST:PP-B analyses.

TABLE 33

REGRESSION ANALYSIS: CAST:SP-B AS CRITERION VARIABLE (ALL INDEPENDENT VARIABLES)

Step No.	Variable Entered-Removed	Sign of Coefficient (R)	Multiple R	Multiple RSQ	Increase in RSQ
1 120	CAST:SP-A	+	0.6552	0.4293	0.4293
2 8	Exposure to Curriculum Projects	+	0.6875	0.4727	0.0434
3 99	Electrical Outlets	+	0.7105	0.5048	0.0321
4 122	CAST:SP-C	+	0.7247	0.5252	0.0204

TABLE 34

REGRESSION ANALYSIS: CAST:SP-B AS CRITERION VARIABLE (OTHER CAST SCORES EXCLUDED)

Step No.		Variable Entered-Removed	Sign of Coefficient (R)	Multiple R	Multiple RSQ	Increase in RSQ
1	9	No. of Curriculum Workshops Attended	+	0.2669	.0712	0.0712
2	25	Teacher's Views on Actual Support Given by Administration	+	0.3740	0.1398	0.0686
3	99	Electrical Outlets	+	0.4267	0.1821	0.0422
4	18	Teaching Periods Per Day	+	0.4648	0.2160	0.0339
5	109	Laboratory Assistants	+	0.5081	0.2582	0.0421

4. CAST:SP (Composite) as Criterion Variable. The results of stepwise regression analysis (Table 35) show that variable 25 (teacher's view on actual support given by administration) entered the prediction equation at step one. Variable 84 (administrator's views of how a teacher should handle adolescents with behavior problems) entered at step two. The two variables together accounted for 16 percent of the variance. Variables 18 (teaching periods per day), 42 (student's liking for assignments), and 15 (teacher's feeling toward class facilities) entered the equation at steps three, four, and five respectively.

This appears to indicate that teachers who are rated high on teacher pupil relationships, type of classroom activities, and teacher personal adjustment (three sub-scores on CAST:SP), are supported by school administrators.

TABLE 35

REGRESSION ANALYSIS: CAST:SP (COMPOSITE) AS CRITERION VARIABLE

(OTHER CAST SCORES EXCLUDED)

Step No.		Variable Entered-Removed	Sign of Coefficient (R)	Multiple R	Multiple RSQ	Increase in RSQ
1	25	Teacher's Views on Actual Support Given by Administration	+	0.3293	0.1085	0.1085
2	84	Administrator's Views of Should Behavior of Teacher With Adolescents	+	0.4088	0.1671	0.0586
3	18	Teaching Periods Per Day	+	0.4570	0.2089	0.0418
4	42	Student's Liking for Assignments	+	0.5017	0.2517	0.0428
5	15	Teacher's Feeling Toward Class Facilities	+	0.5505	0.3031	0.0514

5. SCACL:TP as Criterion Variable. The first stepwise regression including all independent variables (Table 36) revealed CAST:PP-A and CAST:SP-C at first on step two. At step one 13 percent variance was accounted for and at step two 5 percent. Variable 28 entered the prediction equation at step three. This variable is concerned with the teacher's views of what should be done by the school administration to bring variety and balance in instructional techniques. This variable adds only 4 percent variance. Teacher's sex (3 percent) and student's liking for assignments appeared at step four and five respectively to add 8 percent variance.

When CAST scores were excluded from the analysis some new items entered the equation. Variable 25 at step one indicates that teacher's perceptions regarding the type of actual support given by administrators (7 percent) is a strong predictor variable. Teacher's sex, globes and teaching periods per day appeared on steps two, three and four. These account for an additional 9 percent variance (Table 37).

These results indicate that many teachers who desire to teach by an inquiry approach are supported by the administration. The correlations of variable 25 (teacher's view of actual support given by administrators) with teacher's age (r = -0.0109) and teacher's teaching experience (r = -0.0442) are low. This suggests a preference by administrators for younger teachers.

TABLE 36

REGRESSION ANALYSIS: SCACL:TP AS CRITERION VARIABLE (ALL INDEPENDENT VARIABLES)

Step No.		Variable Entered-Removed	Sign of Coefficient (R)	Multiple		Increase in RSQ
				R	RSQ	
1	117	CAST:PP-A	+	0.3563	o.1270	0.1270
2	122	CAST:SP-C	+	0.4205	0.1768	0.0498
3	28	Teacher's Views of Administrator's Help Concerning Instructional Techniques	+	0.4660	0.2171	0.0403
4	3	Teacher's Sex	+	0.4995	0.2495	0.0324
5	42	Student's Liking for Assignments	+	0.5434	0.2953	0.0457

The correlation coefficient (r) between SCACL:TP and CAST:PP-A was 0.356 and significant at .001 level of confidence (Table 14). In addition, the correlation coefficients (r) between SCACL:TP and CAST:PP-B were 0.304 (significant at .05 level) and between SCACL:TP and CAST:PP (Composite) as 0.402 (significant at .001 level). The entry of CAST:PP-A at the first step in Table 36 further strengthens the finding that CAST:PP provides similar information to SCACL:TP.

TABLE 37

REGRESSION ANALYSIS: SCACL:TP AS CRITERION VARIABLE (ALL CAST SCORES EXCLUDED)

Step No.		Entered-Removed	Coefficient (R)	R	RSQ	in RSQ
1	25	Teacher's Views on Actual Support Given by Administration	+	0.2666	0.0711	0.0711
2	3	Teacher's Sex	+	0.3302	0.1090	0.0379
3	105	Globes	-	0.3753	0.1409	0.0318
4	18	Teaching Periods Per Day	+	0.4051	0.1641	.0232
5	2	Teacher's Marital Status	+	0.4427	0.1960	0.0319

Summary of Stepwise Multiple Regression. The predictor variables significant at the .05 level can be arranged according to teacher, student, administrative and other situational characteristics.

1. Teacher related variables (positive relationships):
    a. Exposure to national curriculum materials, attendance at workshops on curriculum materials.
    b. Sex (to favor females).
    c. Teacher's feeling toward class facilities.
    d. Diversity in use of instructional techniques (programmed instruction, laboratory activities, and lecture/discussion).

2. Student related variables (positive relationships):
    a. Student's liking for the science course.
    b. Final grade in last science course.
    c. Liking for assignments (home, class) given by science teacher.
    d. Teacher pupil relationship (as perceived by students).

3. Administrative variables:
    a. Administrator's views on dealing with adolescents.
    b. Administrator's views on diversity of instructional strategies.

c. Teacher pupil relationships (as perceived by supervisors or administrators).

d. Teacher's personal adjustment (as perceived by supervisors or administrators).

e. Teacher's views on type of encouragement received from administration.

f. Teacher's views on administrator's help concerning use of variety and balance in instructional techniques.

The last two variables are based on responses from teachers. These variables, however, explain more concerning administrative characteristics.

4. Situational variables:

a. Fewer periods for teaching per day.

b. Non-regular, non-modified classes.

c. Basic laboratory equipment.

d. Basic physical facilities such as electrical outlets and storage space.

e. Laboratory assistants.

f. National curriculum materials used (perhaps recent and well developed materials with kits and curriculum guides).

The results point out that many teachers using inquiry-oriented activities have been exposed to new curriculum materials through more than one workshop as well as by other means. These teachers feel good about science facilities and cultivate positive teacher pupil relationships. They are well-adjusted with other teachers and staff in the building. Students in their classes like science courses taught and enjoy home or class assignments. Final grades received in the student's last science course are generally high. The administration usually gives the teachers support and encouragement in their instructional efforts.

Another characteristic associated with such teachers is their administrator's belief in the use of a variety of instructional strategies. Basic laboratory equipment and physical facilities are available in science rooms. The curriculum materials used by them tend to be recently developed. The relationship is found between implementation of inquiry-oriented activities and female, younger (r = -0.0235) and single (r = 0.0042) teachers.

Factor Analysis

A second approach utilized in addition to the first one, which involved stepwise multiple regression on all the variables as input, was to factor analyze the independent variables and examine the common characteristics among them by studying their loading on factors.

The BMDX72 program was used for factor analysis. Raw data on all independent variables (119) punched on cards were used as input for this program. This program performed varimax rotation of the factor matrix. It provided a means of determining the minimum number of independent dimensions needed to account for most of the variance in the original set of variables. The rule of Kaiser (1960) and Guttman (1954) was followed with all factors having eigenvalues greater than one rotated. Initial communality estimates were specified to be squared multiple correlations and the maximum number of iterations for communalities to be 10. The maximum limit on correlation coefficients allowed for factoring was 0.950 (Appendix A).

A variable with a factor loading of .25 or greater was considered part of a factor. This loading value was chosen as a cutoff point for it was significant at the .01 level with the number of teachers (86) used in the study. Kerlinger (1964) states that there is no generally accepted standard error for loadings and suggests the above method for determining cutoffs (Peruzzi, 1972, p. 100). Orthogonal or varimax rotation was chosen for factor rotation because of the large number of interrelated independent variables. Rotation of the extracted factors is considered useful to maximize the loading of each variable to one factor while minimizing its loading to all other extracted factors.

This analysis resulted in the extraction of nine factors which accounted for 33 percent of the total variance. Eigen values and the cumulative proportion of total variance are presented in Table 38. The top eigen value obtained was 7.02. This value dropped through 5.84, 4.87, 4.76, 4.33, 3.71, 3.22, 2.96 and 2.79 for factors 2, 3, 4, 5, 6, 7, 8, and 9 respectively.

Tentative names of the nine factors are presented in Table 39.

TABLE 38

EIGEN VALUES AND CUMULATIVE PROPORTIONS OF TOTAL VARIANCE FOR ALL INDEPENDENT VARIABLES

Factor	Eigen Values	Cumulative Variance
1	7.02364	o.05902
2	5.84235	0.10812
3	4.87939	0.14912
4	4.76510	0.18916
5	4.33691	0.22561
6	3.71457	0.25682
7	3.22378	0.28391
8	2.96616	0.30884
9	2.79908	0.33236

TABLE 39

TENTATIVE NAMES OF INDEPENDENT VARIABLES FACTORS

Number	Name
Factor 1.	Maturity of Students.
Factor 2.	Administrator Teacher Interaction.
Factor 3.	Diversity of Instructional Techniques.
Factor 4.	Classroom Climate.
Factor 5.	Teacher's Feelings Toward Facilities and Materials.
Factor 6.	Student's Attitude Toward Science Teachers.
Factor 7.	Advanced Science Career Interest Influence.
Factor 8.	Professional Development.
Factor 9.	Background and Experience of Teacher.

Factor 1, Maturity of Students, contains six positive and six negative factor loadings (Table 40) which are equal to or above a significant .25 value. Three positive variables, students age (.84), grade (.87) level, and number of years of science (.80) since seventh grade, account for 80 percent of the common variance on this factor.

The next best variable, also positive, is variable 17, number of students, which accounts for 60 percent of the common variance. Variable 116, teacher's major field of preparation-physical science, accounts for about 50 percent of the common variance.

Variable 45, student's interest in becoming a scientist, engineer or science teacher, explains 45 percent of the common variance. All negative loadings are below .34. By analyzing the relative factor loadings, it seems logical to regard this factor as a student related factor and connected to their maturity level in science, as indicated by higher loadings on age, number of years of science, fewer students in class, an elective subject (physical science), and higher grade.

TABLE 40

FACTOR 1. MATURITY OF STUDENTS

Variables and Their Respective Factor Loadings

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
17. Number of students in class	.600								
20. Subjects taught	-.331								
35. Student's age in years	.846								
36. Student's grade level	.870								
38. Number of years of science for student	.802								
43. Is this student's best course	-.346					.640			
45. Is student interested in becoming a scientist, engineer or science teacher	.451					.480			
61. Student would not choose a scientific career because can't make much money	-.309								
63. Administrator's age in years	-.320				.250				.290

TABLE 40 (CONTINUED)

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
65. When last attended school by administrator for academic or professional preparation	.274								
105. Globes	-.312							.272	
115. Teacher's major field of preparation-earth science	-.265							.352	
116. Teacher's major field of preparation-physical sciences	.496								.435

Factor 2, Administrator Teacher Interaction, has seven highest negative factor loadings (Table 41). The variables are 25, 26, 27, 28, 29, 30, and 31, each accounting for more than 60 percent of the common variance on this factor. Analyzing the variables further, there are three variables 26, 27, and 28, concerning teacher's feelings of what should be done by administrators/supervisors to help the teacher in the areas of classroom discipline (-.66), classroom climate relating to student teacher interactions (-.66), and variety and balance of instructional techniques (-.72). The other three variables, 29 (-.78), 30 (-.77), and 31 (-.75) are also the teacher's views of what actually was done by the administration in the three areas mentioned. The rest of the variables and loadings on this factor are variable 53 (.26), 56 (.30), 70 (.30), 84 (-.30), and 120 (.33). Thus it seems logical to decide that this factor indicated a pattern of interaction between the teacher and the administrator or supervisor.

TABLE 41

FACTOR 2. ADMINISTRATOR TEACHER INTERACTION

Variables and Their Respective Factor Loadings

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
25. Actual support of teacher by principal/supervisor		-.609							
26. Teacher's feelings about what should be done concerning classroom climate		-.661							
27. Teacher's feelings about what should be done concerning handling of student discipline		-.663							
28. Teacher's feeling about what should be done concerning teacher using a variety and balance of instructional techniques		-.723							
29. Teacher's views of actual action taken by administration concerning classroom climate		-.788							

TABLE 41 (CONTINUED)

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
30. Teacher's views of actual action taken by administration concerning handling of student discipline problems		-.774							
31. Teacher's views of actual action taken by administration concerning teacher using a variety and balance of instructional techniques		-.759							
53. "Self" was most influential person in developing student's interest in scientific career		.267							
56. Another person or factor most influential in developing student's interest in scientific career		.300			-.291				
70. Administrator's view-purpose of teaching science should be understanding nature of science		.301							
84. Administrator's view of what should be a science teacher's understanding of adolescents with behavior problems		-.302		.480					

TABLE 41 (CONTINUED)

	Factor								
Variable	I	II	III	IV	V	VI	VII	VIII	IX
120. CAST:SP-A (Teacher Pupil relationship)		.330				.316			

Factor 3, Diversity of Instructional Techniques, has three best positive factor loadings. These are the administrator's views on the most important instructional strategies for teaching science-lecturing (.77), instructional films (.60), and field study or excursions (.45). Variable 9, number of curriculum projects/workshops attended (.36) is also related to techniques and materials. Other variables on this factor are number of periods per day (.35), periods per week (.34), teacher's exposure to curriculum projects (.25), and teacher's feeling toward curriculum material used (.25). It seemed clear that this factor is related to materials and techniques used in the classroom. Because of relatively higher factor loadings on diversified techniques for teaching, the factor was named as Diversity of Instructional Techniques (Table 42).

TABLE 42

FACTOR 3. DIVERSITY OF INSTRUCTIONAL TECHNIQUES

Variables and Their Respective Factor Loadings

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
8. Teacher's exposure to curriculum projects			.259					.390	
9. Number of curriculum projects/workshops attended by teacher			.361		.283				
14. Teacher's feeling toward curriculum materials used			.251		.551				
18. Number of periods per day for teacher			.353	.302					.354
19. Number of periods per week for teacher			.346	.288					.347
73. Administrator's view-lecturing most important teaching strategy for teaching science			.774						

TABLE 42 (CONTINUED)

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
76. Administrator's view-instructional film is most important teaching strategy for teaching science			.606				-.333		
78. Administrator's view-field study or excursions most important strategy for teaching science			.455				-.262		
79. Administrator's view-programmed instruction most important strategy for teaching science			.347				-.358		
80. Administrator's view-independent study most important strategy for teaching science			.483						
91. Multipurpose room			.456						
93. Storage space			.371						
113. Teacher's major field of preparation biology			-.271	.317					

Factor 4, Classroom Climate, contains variables on the administrator's views regarding disciplinary ability (.62), and teacher's attitude toward adolescents (.65). Both these variables refer to what the teacher's ability should be in these areas. Another group of variables with high factor loadings are the administrator's views on how he should help teachers in handling student discipline (.57), classroom climate relating to teacher student interactions (.61), and concerning a teacher's using a variety and balance of instructional techniques. Variable 85 concerning the administrator's views on the type of encouragement he provides science teachers has the next highest factor loading (.42). It seemed apparent that an essential character of this factor was concerning classroom instruction and variables that might affect it, such as discipline, teacher student interactions, and dealing with teenagers with behavior problems. Variables indicate the administrator's views on what he would ideally prefer in teachers for handling such situations but also what he himself would do. This factor, based on the above considerations, was thought to be of a comprehensive nature, and is designated as Classroom Climate (Table 43).

TABLE 43

FACTOR 4. CLASSROOM CLIMATE

Variables and Their Respective Factor Loadings

Variable	Factor								
	I	II	III	IV	V	VI	VII	VIII	IX
10. Teacher participation in curriculum workshops with materials only				-.256				.404	
18. Number of periods per day for teacher			.353	.302					-.354
19. Number of periods per week for teacher			.346	.288					-.347
23. Publication date of text-book used				.270					
59. Student would not choose a scientific career because scientists are peculiar people				.276		-.323			
82. Administrator's view of what should be a science teacher's disciplinary ability				.627					

TABLE 43 (CONTINUED)

Variable	I	II	III	Factor IV	V	VI	VII	VIII	IX
83. Administrator's view of what should be a science teacher's a ttitude toward adolescents				.653					
84. Administrator's view of what should be a science teacher's understanding of adolescents with behavior problems		-.302		.480					
85. Administrator's view-type of encouragement given by him				.428					
86. Administrator's view of what should be his approach concerning classroom climate relating to teacher student interactions				.618					
88. Administrator's view of what should be his approach concerning teacher's using variety and balance of instructional techniques				.607					

TABLE 43 (CONTINUED)

Variable	I	II	III	Factor IV	V	VI	VII	VIII	IX
107. Other teaching aids for demonstration, etc.				.355	.304				
110. Permitted to go outside school grounds				-.336			-.281	-.288	
111. Transportation facilities				-.390					
113. Teacher's major field of preparation biology			-.271	.317					

Factor 5, Teacher's Feelings Toward Facilities and Materials, contains five variables that are related to physical facilities available in schools. These are the teacher's feelings toward facilities (.46), basic laboratory equipment (.72), glassware (.52), basic laboratory chemicals (.45), and funds for perishables, chemicals and specimens (.64). Another dimension of this factor is in the area of curriculum materials, with variables such as the teacher's feeling toward curriculum materials used (.55), and use of a national curriculum project (.38). Variable 67, the administrator's view of the purpose of teaching science is the development of laboratory techniques (.32), further lends support to the facilities and curriculum material aspect of the factor. The factor, based on these considerations, was named Teacher's Feelings Toward Facilities and Materials (Table 44).

TABLE 44

FACTOR 5. TEACHER'S FEELINGS TOWARDS FACILITIES AND MATERIALS

Variables and Their Respective Factor Loadings

Variable	I	II	III	IV	V	VI	VII	VIII	IX
	Factor								
9. Teacher's exposure to curriculum projects			.361		.283				
14. Teacher's feeling toward curriculum materials used			.251		.551				
15. Teacher's feeling toward classroom facilities					.464		.303		
16. Teacher's feeling toward grading and reporting					.234				
22. Did teacher use a national curriculum project					.384				
37. Student's sex					-.287		.284		
56. Another person or factor most influential in developing student's interest in scientific career		.300							

TABLE 44 (CONTINUED)

Variable	I	II	III	IV	V	VI	VII	VIII	IX
				Factor					
63. Administrator's age in years	-.320				.250				.290
67. Administrator's view-purpose of teaching science should be development of laboratory techniques					.320				
89. Preparation room					.285				
92. Plant growth area					.347				
94. Sinks					.359				
95. Cold water outlet					.360				
96. Hot water outlet					.451		.313		
97. Gas outlet					.429				
99. Electrical outlets					.283				
102. Glassware					.525				.265
103. Basic laboratory equipment					.725				

TABLE 44 (CONTINUED)

Variable	I	II	III	IV	Factor V	VI	VII	VIII	IX
104. Basic laboratory chemicals					.452				
107. Other teaching aids for demonstration, etc.				.355	.304				
108. Funds for perishables, chemicals and specimens					.640				
114. Teacher's major field of preparation comprehensive science					-.296				-.309

Factor 6, Student's Attitude Toward Science Teachers, has 20 variables which account for between 25 to 83 percent of the common variance. Among the top variables are the student's liking of the assignments given by the science teacher (.76), the student's liking for this science course (.83), "best" science course so far (.64), teacher pupil relationship (.72), would not choose a career in science because science is too difficult (-.50), and interested in becoming a scientist, engineer, or science teacher (.48). Other variables which account for a 30 to 40 percent variance are the teacher's sex (.33), level of class-advanced (.37), scientists are peculiar people (-.32), development of scientific attitude (.36), and compressed air outlets (.30). The nature of the factor from these variables points in the direction of student-relatedness. Further, the variables are so specific in pointing out students' choices to particular science teachers, a science course and scientific careers. Based on these considerations the factor was named Student's Attitude Toward Science Teachers (Table 45).

TABLE 45

FACTOR 6. STUDENT'S ATTITUDE TOWARD SCIENCE TEACHER

Variables and Their Respective Factor Loadings

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
3. Teacher's sex						.336			
11. Teacher's participation in curriculum projects/workshops with material and students						.256			
12. Teacher's feeling toward time class meets						.253			
13. Teacher's feeling toward students in group						.260	.430		
24. Full-time teaching experience in years						-.264			.379
25. Actual support of teacher given by principal/supervisor			-.609			.259			
32. Level of class used for study-advanced						.375	.448		

TABLE 45 (CONTINUED)

Variable	I	II	III	Factor IV	V	VI	VII	VIII	IX
34. Level of class used for study-modified						-.252			
41. Does student like this science course						.835			
42. Does student like assignments given by science teacher						.765			
43. Is this student's best science course so far	-.346					.640			
44. Adult occupation preferred by student						.258			
45. Is student interested in becoming a scientist, engineer, or science teacher?	.451					.480			
50. Teacher most helpful in developing student's interest in scientific career						.290			

TABLE 45 (CONTINUED)

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
58. Student would not choose a career in science because science is too difficult						-.504		.310	
59. Student would not choose a career in science because scientists are peculiar people				.276		-.323			
60. Student would not choose a career in science because math is too difficult						-.337			
69. Administrator's view-purpose of teaching science should be development of scientific attitude						.361			
98. Compressed air outlets						.309			
117. CAST:PP-A (Teacher Pupil Relationship)						.723			
120. CAST:SP-A (Teacher Pupil Relationship)		-.330				.316			

Factor 7, Advanced Science Career Interest Influence, was a relatively complex factor as the factor loadings on it were examined. The variables feelings toward students in group (.43), level of class-advanced (.30), level of class-regular (-.36), grade in last science course (.32), a career as scientist, engineer, or science teacher (.32), refrigerator (.40), specimens (.43) point out that the factor is connected to students who liked science and were placed in schools with adequate science facilities. These students were interested in pursuing a career in science which is of an advanced nature and were more prone to become scientists than engineers or science teachers. Thus it seemed logical that the name of this factor should contain qualities of advanced students, their career choices in pure sciences, and the impact on the teacher's feelings and administrator's views (Table 46).

TABLE 46

FACTOR 7. ADVANCED SCIENCE CAREER INTEREST INFLUENCE

Variables and Their Respective Factor Loadings

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
13. Teacher's feelings toward students in group						.260	.430		
15. Teacher's feelings toward classroom facilities					.464		.303		
32. Level of class used for study-advanced						.375	.448		
33. Level of class used for study-regular							-.368		-.255
37. Student's sex					-.287		.284		
39. Student's final grade in last science course							.328		.273
46. What would student choose for career-scientist, engineer or science teacher							-.408		

TABLE 46 (CONTINUED)

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
48. Mother most helpful in developing student's interest in scientific career							-.522		
49. Father most helpful in developing student's interest in scientific career							-.316		.332
54. Counsellor most helpful in developing student's interest in scientific career							-.425		
55. Relative most helpful in developing student's interest in scientific career							-.381		
71. Administrator's view-purpose of science teaching should be to develop creativity							-.298		
76. Administrator's view-instructional film most important strategy for teaching science			.606				-.333		

TABLE 46 (CONTINUED

Variable	I	II	III	Factor IV	V	VI	VII	VIII	IX
78. Administrator's view-excursions or field study most important strategy for teaching science			.455				-.262		
79. Administrator's view-programmed instruction most important strategy for teaching science			.347				-.358		
96. Hot water outlet						.451	.313		
100. Microscope							.274		
101. Refrigerator							.403		
106. Specimens							.437		
110. Permitted to go outside school grounds							.281	-.288	

Factor 8, Professional Development, contains factor loadings that describe a teacher who has been working on a formal degree (.72), who is professional (.72), has participated in workshops (.40), and been exposed to national curriculum projects (.39). The other variables are a sister most helpful in deciding to pursue a scientific career (.29), science too difficult (.35), and able to go outside school grounds (-.28). From this it seems that the dimensions of the variable are quite strong around the theme of the teacher and his continuing inservice education that might help him professionally. Hence the name, Professional Development, was given to this factor (Table 47).

Factor 9, Background and Experience of Teacher, had only one variable (77) with a high loading (0.30) in common with regression analysis results. Other factor loadings were low and scattered over many variables. The table for this factor is not presented here.

TABLE 47

FACTOR 8. PROFESSIONAL DEVELOPMENT

Variables and Their Respective Factor Loadings

Variable	I	II	III	Factor IV	V	VI	VII	VIII	IX
6. Teacher working on a formal degree								.720	
7. Is nature of teacher's degree program academic or professional								.729	
8. Teacher's exposure to curriculum projects			.259					.390	
10. Teacher participation in curriculum project/workshop with materials								.404	
51. Sister most helpful in developing student's interest in scientific career								.290	
58. Student would not choose a career in science because science is too difficult								.310	

TABLE 47 (CONTINUED)

Variable	Factor I	II	III	IV	V	VI	VII	VIII	IX
105. Globes		-.312						.272	
110. Permitted to go outside school grounds				-.336			.281	-.288	
115. Teacher's major field of preparation earth science		-.264						.352	

Summary of Regression Analysis and Factor Analysis

By combining the results of regression analysis and factor analysis it is possible to find some common characteristics which are influenced by particular variables. Two predictor variables, 25 and 28, which concern a teacher's views on actual support given and what he/she would like to see from an administrator load on factor 2. This factor, Administrator Teacher Interaction, seems to be an important indication to determine the type of activities conducted by teachers in science classrooms.

Variables 73, 77, 79, 18, 37, and 8 have high loadings on factor 3, Diversity of Instructional Techniques. It seems that a teacher's exposure to national curriculum projects (variable 8) is related to the use of diversified techniques such as programmed instruction (79), laboratory activities (77), and lecture/discussion (73). Fewer teaching periods (18) and the student's sex (37) tend to be related to the use of diversified techniques.

Loadings of variables 2, 18, 22, and 84 have high loadings on factor 4, Classroom Climate. The logical inference may be drawn from this that the type of activities a science teacher is likely to perform in a classroom tend to be related to the general climate of the classroom. Certain variables which are important to consider in promoting an appropriate type of activity in the classroom are related to the use of new and national curriculum projects (22), fewer teaching periods (18), female sex (2), and a positive attitude on the part of the teacher to help adolescents with behavior problems (84).

Variables 99, 108, 109, 22, and 34 have high loadings on factor 5, Teacher's Feelings Toward Facilities and Materials. It seems that the presence of facilities in terms of basic physical needs, such as electrical outlets (99), replacement of perishable supplies (108), and laboratory assistant tend to be strongly related to the type of activities performed in classrooms. Another dimension of this finding is that a teacher should feel good about materials used (22). The teacher's use of appropriate types of science activities does not relate strongly with the modified nature of the class.

Most of the predictor variables, 3, 28, 42, 103, 117, 120 and 122, cluster on factor 6, Student Attitude Toward Science Teacher. The teacher pupil relationship (117, 120) is a very strong predictor of the type of activities implemented. Another aspect related to a student's liking for a science course assignments (42), and perhaps positive attitude toward the teacher, are related to the presence of basic equipment (103) needed to perform laboratory-oriented activities. The teacher's personal adjustment (122) is also reflected in the student's attitude toward the teacher.

Variables 15 and 37 have loadings on factor 7, Advanced Science Career Interest Influence. The teacher's use of the appropriate type of activities is related to the type of materials used (37) and feelings toward facilities (15).

Factor 8, Professional Development, has a high loading for variable 8 (teacher's exposure to national curriculum projects). This variable has appeared on factor 3 as well. Other variables which appear on factor 8 are related to the teacher's inservice and continuing education. It seems that exposure to curriculum project materials and perhaps other inservice education would be reflected in the type of activities used by teachers.

There were four hypotheses stated in Chapter I which were concerned with the identification of variables with significant relationships to the type of activities implemented by science teachers in the classroom. The hypotheses were as follows:

Hypothesis 6. *The types of science classroom activities used by the program graduates in schools are not significantly related to student characteristics*.

Hypothesis 7. *The types of science classroom activities used by the program graduates in schools are not significantly related to teacher characteristics*.

Hypothesis 8. The types of science classroom activities used by the program graduates in schools are not significantly related to situational variables present in their schools.

Hypothesis 9. The types of science classroom activities used by program graduates in schools are not significantly related to the variables concerned with the administration of schools.

Based on the analysis in this section, a number of variables pertaining to teacher characteristics, student characteristics, situational variables, as well as administrator-related variables, have been found to be strong predictors of the type of classroom activities performed by science teachers. Hence hypotheses 6,7,8, and 9 are rejected.

Interpretation of Written and Oral Comments

During the personal interviews conducted by the investigator, the school administrators/science supervisors and science teachers offered their oral impressions of the preservice program. A majority of teachers provided written feedback on the *Teacher's Questionnaire*.

The comments were grouped according to their content. The groups identified concerned with the preservice program were: Field experience, on-campus experiences, and miscellaneous. Frequencies of responses for each of the group were counted. A large number of comments were given concerning specific courses taken on campus. However, the frequencies for any particular course were small (under five) so these were dropped from further consideration (Appendix I).

From the graduation years 1973-74, and 1972-73, all graduates except one expressed a strong opinion in favor of school-based experiences during the five quarters sequence in the preservice program. A total of 14 graduates from the graduation years 1969-70, 1970-71, and 1971-72 suggested a need for more school-based preservice experiences. It was interesting to note that all these latter graduates had participated in a two-quarter Senior Project. This program has since been expanded to a five-quarter junior and senior year experience.

A major category of suggestions was related to additional emphasis in dealing with classroom discipline and management. The frequency breakdown of teachers suggesting this was one, seven, six, seven, and seven for the graduation years 1969-70, 1970-71, 1971-72, 1972-73, and 1973-74 respectively. The percentage of responses received in this study, related to the teacher's concern about classroom discipline, was lower than in the other study conducted by Cruikshank within the College of Education (1974). This may be in part due to prompted response type questions used for collecting data in the other study as compared to the open-ended type of questions used in this study. The responses received in this study may reflect a genuine concern on the part of certain sample teachers in this study.

A further analysis was made to discern possible reasons for the particular teacher's concern in the area of classroom discipline. It was considered important to study each individual who made the suggestion for scores on SCACL:TP, CAST:SP-A, CAST:PP-B, level of class taught (variable 32, 33, or 34) and teacher's view of administrative support given (variable 25). The reason for selection of these scores was to ascertain in the light of the evidence in this study if administrative help, level of class, or lack of inquiry-oriented activities were responsible for a teacher's discipline-related problems. It was found that by using a sign test (+ above mean, - below mean) no clear pattern existed on SCACL:TP and level of class variable. However, administrative help was viewed as unsatisfactory by the concerned teachers. In addition, the scores on CAST:PP-B and CAST:SP-A were below the mean for 20 teachers. This suggested that these teachers did not implement many inquiry-oriented activities and that teacher-pupil relationships were perceived by supervisors as below mean.

Hence it suggests that rather than inadequate preparation in the area of classroom discipline it is in part a function of the teacher's lack of implementation of inquiry-oriented activities in the classroom. Administrative help and encouragement given teachers in the instructional field was also minimal for teachers implementing less of inquiry-oriented activities in the classroom.

CHAPTER V

SUMMARY, DISCUSSION AND RECOMMENDATIONS

The purpose of this study was to conduct a follow-up of secondary science teachers graduated from The Ohio State University during the period 1969-1974. Three main objectives were identified:

1. To determine changes from preservice to inservice in a science teacher's views regarding appropriate types of classroom activities;
2. To determine types of activities actually implemented in classrooms; and
3. To identify a set of predictor variables which show relationships to teachers' views and to types of activities actually implemented.

During the years mentioned the preservice program has been revised to include from two to five quarters of field-based experiences. An important objective emphasized during the preservice program was to teach science in secondary schools by using activity-oriented, student-centered instructional strategies. Several studies, reviewed in Chapter II, have been completed on different aspects of the program. These involved either preservice teachers or first-year teachers. The special interest of this study was to investigate the performance of graduates in relation to program objectives after they have taught for one to five years.

The sample was drawn from program graduates who were full-time teachers during the 1973-74 school year in Ohio and who graduated from the preservice program in the period between 1969 and 1974. The final sample consisted of 86 teachers. A battery of instruments was administered to teachers, to pupils in a single class per teacher, and to supervisors or administrators. The instruments were: Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP), Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP), Checklist for Assessment of Science Teachers: Pupil's Perceptions, (CAST:PP), Teacher's Questionnaire (T.Q.), Student's Questionnaire (S.Q.), Administrator's Questionnaire (A.Q.), and Facilities Checklist (F.C.). In addition, personal non-structured interviews were conducted with each teacher and his/her supervisor. Preservice scores on SCACL:TP for sample teachers were collected from the records available in the appropriate faculty office at the university.

Data were analyzed statistically by analysis of variance, multivariate analysis, stepwise regression analysis, and factor analysis. The results of this study are described according to the separate hypotheses.

Hypothesis 1. The secondary science teachers graduated from The Ohio State University have not significantly changed their views regarding appropriate types of science classroom activities during their teaching careers in schools.

Changes in views of science teachers regarding the appropriate type of classroom activities were assessed by comparing their preservice and inservice scores on SCACL:TP. The data for this analysis were organized according to the length of teaching experience, type of school of current employment, and different versions of preservice program attended. Tables 18, 19,and 20 present the means and standard deviations for different groups. Results of analysis of variance and SCACL:TP inservice scores as criterion are presented in Table 21 separately for the three categories mentioned.

No significant differences were found at the .05 level between mean scores for teachers in different groups. Therefore, hypothesis 1 was not rejected. This result suggests that teachers trained in the field-based program continue to hold views, after one to four years of teaching, that are similar to their views regarding appropriate types of classroom activities during their preservice training. The importance of this result lies in the fact that a high emphasis is placed in the preservice program on inquiry-oriented teaching.

Hypotheses 2, 3, 4, and 5 were concerned with the differences in the type of classroom activities actually utilized by science teachers. Data examined for all these four hypotheses were subscores B on CAST:PP and CAST:SP. One-way analysis of variance was performed to analyze the data for all four hypotheses.

Hypothesis 2. There is no significant difference in the types of science classroom activities used in the schools by program graduates with different amounts of full-time teaching experience.

Means and standard deviations of CAST:PP-B and CAST:SP-B according to length of teaching experience are given in Table 22. The mean scores on CAST:SP-B, an index of inquiry-oriented instruction, ranged from 19.7 to 22.1 out of a maximum possible of 25. Results of analysis of variance are presented in Table 26. The F-ratios were found to be non-significant at the .05 level. Hypothesis 2 was not rejected. This result provides an evidence that teachers, up to five years after their field-based preservice training, used inquiry-oriented activities. The differences in the use of inquiry teaching among teachers with one to five years of teaching experience were non-significant.

Hypothesis 3. There is no significant difference in the types of science classroom activities used by program graduates employed in different types of schools.

Data for this hypothesis are presented in Tables 23 and 27. No significant differences were found at the .05 level for types of science classroom activities used by science teachers in different types of schools. Hypothesis 3 was not rejected. The mean scores on CAST:SP-B ranged from 18.0 to 22.5, which is an evidence for inquiry-oriented instruction in classrooms. Type of school of employment did not seem to make a significant impact on how much inquiry-oriented instruction was conducted by teachers graduated from a field-based program.

Hypothesis 4. There is no significant difference in the types of science classroom activities used by graduates with different fields of their main instructional specialization.

Data for this hypothesis are presented in Tables 24 and 28. No significant differences were found in mean scores at the .05 level. Hypothesis 4 was not rejected. The mean scores ranged between 19.9 and 21.4 on CAST:SP-B. This indicates that inquiry-oriented activities were implemented by teachers with different fields of specializations.

Hypothesis 5. There is no significant difference in the types of science classroom activities used by graduates who received their education in different versions of the preservice teacher education program.

Data for this hypothesis are presented in Tables 25 and 29. No significant differences were found in mean scores at the .05 level. The hypothesis was not rejected. The range of mean scores on CAST:SP-B was between 20.0 and 21.6. This is an indication of no matter what version of the field-based pre-service program was attended by teachers they conducted inquiry-oriented instruction in the classroom in a similar manner.

The next four hypotheses were concerned with the relationship of two criterion variables with four categories of variables -- teacher characteristics, student characteristics, situational variables, and administrative variables. Data were collected mainly through four questionnaires, T.Q., S.Q., A.Q., and F.C. In addition, certain sub-scores on CAST (CAST:SP-A, CAST:SP-C, and CAST:PP-A) were also analyzed for independent variables. Statistical analysis involved stepwise regression of all independent variables with the criterion variables, and factor analysis. A number of independent variables from each of the four categories (teacher, student, administrative, and situational) were found to be strong predictors.

Hypothesis 6. The types of science classroom activities used by the program graduates in schools are not significantly related to student characteristics.

From stepwise regression analysis three student-related variables were found to be significant (.05 level) predictors for types of science classroom activities. These were the students' liking of assignments, the students' liking of the course and the final grade in his/her last science course. Based on the findings of these significant student-related predictor variables, hypothesis 6 was rejected.

The results presented in Tables 31, 32, and 35 are an indication of two related points. First there is a relationship between what a teacher does (classroom activities) and how students feel about the course. Secondly, in this study students liked the teacher's use of inquiry-oriented and student-centered approaches in the classroom.

Hypothesis 7. The types of science classroom activities used by the program graduates in schools are not significantly related to teacher characteristics.

From stepwise regression analysis 10 teacher-related variables were found to be significant predictors at the .05 level (Tables 30, 31, 33, 34, 35, and 36). These were: Teacher pupil relationships; teacher's personal adjustment; teacher's views of how administrators should help concerning use of variety and balance in instructional techniques; sex (female); marital status (single); teacher's views on actual support and encouragement provided by administrators; feelings toward class facilities; exposure to national curriculum projects; number of national curriculum-related workshops attended; and feelings toward instructional materials used.

Based on these findings hypothesis 7 was rejected. It is clear from the analysis that the conduct of inquiry-oriented activities in a classroom is connected to many other conditions fulfilled previously or simultaneously. The teacher's preparation and experience with newly-developed inquiry-oriented curriculum materials, selection of instructional materials of teacher's choice, presence of sufficient facilities in terms of equipment and physical needs and fixtures, perhaps, provide necessary pre-conditions. The teacher views administrative support for the teaching strategies to be used as important.

Hypothesis 8. The types of science classroom activities used by the program graduates in schools are not significantly related to situational variables present in their schools.

From stepwise regression analysis certain situational variables were found to be significant predictors at the .05 level (Tables 30, 31, 33, 34, and 37). The variables were: funds for perishables, chemicals, and glassware; storage space; level of class (advanced/regular/modified); permission for field trips; basic physical laboratory facilities (electrical outlets); teaching periods per day; laboratory assistants; other teaching aids for demonstration and the like; and globes. Based on these findings hypothesis 8 was rejected.

The results indicate that the situation a teacher finds himself or herself in is quite important in deciding whether or not inquiry-oriented activities will take place in the classroom. Besides the presence of necessary equipment and fewer periods per day needed for making preparations, the level of the students' ability in a class is an important variable to consider.

"Modified" classes, which were explained in this study as a designation for slow learners, restrict the teacher's use of inquiry-oriented activities in the classroom. Whether inquiry-oriented activities are not suitable for slow learners is a question that cannot be answered from the limited data in this study. It seems, in the absence of necessary data, that a negative correlation between "modified" class and use of inquiry-oriented activities may be a function of several other conditions; such as lack of well-defined science curriculum policies for modified classes, inadequate administrative guidance and leadership, lack of suitable textbooks or other reading materials, and too little encouragement and support of students from their homes.

Hypothesis 9. The types of science classroom activities used by the program graduates in schools are not significantly related to the variables concerned with the administration in schools.

The predictor variables found to be significant at the .05 level (Tables 30, 31, 33, 34, 35, and 37) in stepwise regression included the administrator's views on the most appropriate science teaching strategies (laboratory activity, programmed instruction, lecture/discussion), and the administrator's view of how a teacher should deal with adolescents having behavior problems, as well as the administrator's perception of teacher pupil relationships and the teacher's personal adjustment. The teacher's views on administrative help given was one of the strongest predictor variables. The findings are quite clear on the importance of administrative variables in predicting the teacher's use of inquiry-oriented activities. Based on these findings, hypothesis 9 was rejected.

The results indicate that an administrator is generally supportive of a teacher who is implementing inquiry-oriented activities in the classroom. The administrator's belief in the use of diversified instructional techniques goes hand in hand with the utilization of inquiry-oriented activities. Another feature of this analysis is the positive relationship between the willingness on the part of the teacher to work with problem students and to make use of inquiry-oriented activities. Administrators are quite supportive of teachers in this respect.

Discussion

The finding that no significent changes occurred in the views of science teachers regarding appropriate classroom activities even after four years of teaching experience is important in considering implications for field-based teacher education programs. It is a positive indication that field-based programs can, in fact, enable teachers to regard student-centered and inquiry-oriented instructional strategy as important and useful for several years after preservice training.

The above-mentioned finding of the stability of teachers' views is in sharp contrast to the findings of Brewington (1971) and Cignetti (1971) who administered the same instruments to teachers not trained in extended field-based programs. They reported a drop in the views of science teachers concerning inquiry-oriented activities at the end of the first year of teaching.

Any specific aspects of the field-based program were not examined in the present study. It is possible, however, that the cumulative effect of several aspects present in a field-based program is responsible for stability in the views of teachers on implementing inquiry-oriented activities in a classroom. It was beyond the scope of this study to explain why an increase or decrease in the teacher's views did not occur after years of teaching experience.

No significant differences were found in the types of classroom activities implemented by science teachers prepared in different versions of the preservice program. Any firm explanation of this finding to the contrary cannot be made from the limited sample of this study. Why science teachers receiving less or more quarters of preservice experience did not implement different types of activities can be answered to some extent by controlling some other variables, such as teaching experience.

It may be recalled that teachers who had been teaching for four or five years completed two quarters of preservice education, while the majority of sample teachers with three or less years of teaching experience completed their preservice program in three, four, or five quarters. Which of these two groups of teachers utilized more inquiry-oriented strategies in their first three years of teaching? The conclusive answer cannot be given in this study.

The correlation between teaching experience and SCACL:TP was found to be negative (r = -0.0040) in this study. This suggested that inquiry-oriented activities were generally implemented in classrooms taught by less experienced teachers. Looking at the other side of this, some important evidences were present to explain the difficulties found by more experienced teachers.

The teachers with more teaching experience were generally given "modified" classes to teach. This in itself presents a problem as far as the implementation of inquiry-oriented activities are concerned (r = -0.2737). In addition, administrative support and encouragement given to the more experienced teachers in this study were lower (r = -0.0442).

Many studies (Cruikshank and Broadbent, 1965, Bledsoe, 1967, Stone, 1965, and Hunter, 1967) have revealed that teachers in the beginning years confront a great number of problems. It was, however, encouraging to find that first-year sample teachers utilized the same type of activities as did more experienced teachers.

Kochendorfer's study (1966) showed that when all teachers are trained in a conventional program, teachers with five years or more teaching experience implemented more classroom laboratory investigation-oriented activities than teachers using the same curriculum materials. This finding was not supported by the results of the present study. The types of activities implemented by beginning teachers as well as those implemented by the experienced teachers were found to be similar. This is an important finding which suggests that field-based programs can solve at least partially a major concern faced in the training of teachers for the future.

The teachers who indicated discipline related problems in their classrooms implemented fewer inquiry oriented activities, as indicated by CAST:PP-B scores. Such teachers were rated by administrators as having difficulties in developing positive teacher pupil relationships. The relationship between teacher pupil relationships and inquiry-oriented activities is significantly positive (r = 0.6552). It seems that teachers should implement inquiry-oriented activities in the classroom which seek student involvement, thereby helping to reduce discipline related problems as well as lack of administrative support and encouragement. Howe (1964) reported low student achievement was correlated to low teacher pupil relationships. This further strengthens the finding of this study.

Teacher related variables found to be strong predictors of implementation of inquiry-oriented activities in this study are in agreement with many other investigators. Teacher pupil relationships were reported as a significant variable by Howe (1964), Williamson (1956), Brown (1972), and Best (1970) and the teacher's personal adjustment by Howe (1964) and Williamson (1956). Exposure to national curriculum projects, attendance at workshops have been shown to influence classroom instruction in many studies (LaShier, 1970, Vickery, 1969, Perkes, 1971, Blosser, 1969, Hall, 1970, Westmeyer, 1967). Feelings toward materials used (Petit, 1969), feelings toward facilities, and support and encouragement given by administration in terms of instructional leadership (Peruzzi, 1922) and sex (Anderson, 1950) were other significant predictor variables. Significance of these variables for pre-service education curriculum includes providing sufficient experience in recent curriculum materials. Training in human relations may help teachers to develop positive relationships with pupils as well as with colleagues in schools.

Student-related predictor variables of implementation of inquiry-oriented activities in the classroom included grade in last science course, student's interest in science (Finkel, 1961, Mitchell, 1967, Spangenberg, 1970), and student's liking for assignments. Students generally like inquiry-oriented teaching. The responsibility for providing activities to maintain their interest in science lies with the teacher to a large extent.

Administrative variables such as views on how to help adolescents with behavior problems, and views on utilizing a variety of teaching strategies (programmed instruction, laboratory activity, and lecture/discussion) have been shown by Peruzzi (1972) to be important variables for predicting supervisory styles in a science department. In addition, it has been well-documented that an administrator's support of teachers influences their performance (Richardson and Blocker, 1963, Pryor, 1964, and Chung, 1970). In a national survey Schlessinger et al. (1973) showed that about 61.2 percent of teachers (total N = 2500) regarded administrative support as of high importance. The implications of these variables are many for preservice programs. Training in developing an understanding of an administrator's viewpoint on teaching as well as handling behavior problems of students might be useful additions to a teacher education curriculum.

Situational variables found to be significant predictors for implementation of inquiry-oriented activities in this study, and in agreement with others, include fewer periods per day (Disinger, 1971), basic laboratory equipment and facilities (Engelhardt, 1970, Brewington, 1972, Howe et al., 1973). Other variables which were specifically mentioned in this study for conducting inquiry-oriented activities such as globes and funds for perishables have been supported in research literature (Miller, 1972, Baas, 1972). The administrators responsible for procuring equipment and supplies should be mindful of this finding. The type of activities utilized in a science classroom to some extent depend on what is available.

The majority of teacher, student, situational and administration related variables found to be significant predictors for the utilization of inquiry-oriented activities have one thing in common. These variables are changeable in nature. An individual with proper training and adequate support may be able to improve his/her ratings on these variables. This aspect of predictor variables found in this study provides hope for continuing improvement in teacher education in the future.

A comparison of teachers' scores in this study to other studies (Brown, 1972, Howe, 1964, Best, 1970) reveal that the graduates from the field-based program at The Ohio State University achieved higher mean scores on common instruments. The mean scores were compared to these studies on teacher pupil relationships, and teacher's personal adjustment. Scores on Science Classroom Activity Checklist: Teacher's Perceptions were compared to Sagness' (1970) sample. Higher scores obtained by graduates in this study may reflect their better preparation.

In summary, it is appropriate to say that the field-based program at The Ohio State University serves a useful purpose in preparing secondary science teachers who continue to view inquiry-oriented methods as important for their classrooms. Most of the graduates teach by implementing inquiry-oriented activities. A number of graduates who view inquiry-oriented activities as important do not utilize them in the classroom. The study of comparative usefulness of this field-based program to any other program was beyond the scope of this study.

Recommendations

The following recommendations are made based on the data collected in this study.

Program

1. Exposure and experience in teaching newly-developed curriculum materials should be continued in the preservice program.

2. Preservice curriculum should include experiences that develop a teacher's ability to work with school administrators.

3. Preservice programs should include experience to develop a teacher's ability in the following areas:

   A. To work with students having behavior problems.

   B. To make optimum use of school facilities and science equipment.

   C. To cultivate positive teacher pupil relationships and to make a healthy personal adjustment to others in the school.

   D. To work with students with less than adequate interest and ability in science.

E. To use diversified instructional techniques for meeting the needs of different students.

F. To plan varied activities to supplement a given textbook.

Schools

1. School administrators are encouraged to secure basic science equipment and materials needed by teachers.

2. Regular inservice education-related activities should be encouraged which are initiated either by individual teachers, the administration, or an outside agency.

3. Use of curriculum materials which incorporate recent developments in content and appropriate pedagogy should be encouraged.

4. Administrators should provide guidance and encouragement for using a variety of instructional techniques in the classroom.

5. Schools should explore the possibility of providing personnel to assist in laboratories.

6. Administrators should employ new teachers and encourage already employed teachers to be adequately prepared in new curriculum materials.

7. Administrators should continue seeking arrangements which free science teachers for laboratory preparation.

8. Administrators should help teachers to work with slow learners in their classrooms.

General

1. Communication with former graduates should be maintained on a regular basis.

2. Preservice data should be collected on SCACL:SP, CAST:PP and CAST:SP (cooperating teachers, principals, and the like) instruments for making a strong data base.

Further Research

1. Additional follow-up studies should be conducted in future years utilizing the data in this study for comparison purposes.

2. Pupils' learning outcomes should be examined to establish effectiveness of the field-based program at The Ohio State University.

BIBLIOGRAPHY

BIBLIOGRAPHY

Adams, Ronald D. Follow-up and Evaluation of Teacher Education Graduates - A Pilot Study. Final Report. Bowling Green, Kentucky, Western Kentucky University, 1974. ED090173

Ager, Merlin Fred. "A Study of the Relationships Between Selected Personality Variables and Verbal Behavior, Supervisory Ratings and Grades of Student Teachers." Dissertation Abstracts, Vol. 28, No. 12, Part 1, 1968.

Altman, Irwin Harold, "Teacher-Student Interaction in Inner City and Advantaged Classes Using the Science Curriculum Improvement Study" (unpublished Doctor's dissertation, University of California, Los Angeles, 1970.)

Anderson, Kenneth E. "A Frontal Attack on the Basic Problem in Evaluation: The Achievement of the Objectives of Instruction in Specific Areas." Journal of Experimental Education, Vol. 18, 1950.

Anderson, Kenneth E., "The Relative Achievements of the Objectives of Secondary School Science in a Representative Sampling of Fifty-Six Minnesota Schools" (unpublished Doctor's dissertation, University of Minnesota, Minneapolis, 1949)

Ashley, James P. "A Study of the Impact of an Inservice Education Program on Teacher Behavior." Dissertation Abstracts, Vol. 28, No. 10, Part A, 1968.

Baas, Alan M. Science Facilities: Educational Facilities Review Series Number 11. Eugene, Oregon, University of Oregon, 1973. ED071144

Baker, Robert Morris. "A Study of the Effects of a Selected Set of Science Teaching Materials (Elementary Science Study) on Classroom Instructional Behaviors." Dissertation Abstracts, Vol. 31, No. 7, Part A, 1971.

Balzer, A. L., T. P. Evans and P. E. Blosser. *A Review of Research on Teacher Behavior*. Columbus, Ohio, ERIC Information Analysis Center for Science, Mathematics and Environmental Education, The Ohio State University, 1973.

Bauman, Dan. *FORTAP A Fortran Test Analysis Package*. Fredonia, New York, State University College, 1973.

Berger, J. Joel. "A Determination of the Relative Effectiveness of Two Specific Teaching Methods on the Ability of High School Chemistry Students to Write Chemical Formulas and to Apply this Knowledge to a New Problem Solving Situation." *Dissertation Abstracts*, Vol. 24, No. 7, 1964.

Best, Effie Deland, "An Exploratory Study of the Correlates of Student Decision Making in the Secondary School Biology Laboratory" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1970)

Bledsoe, Joseph et al. *Comparison Between Selected Characteristics and Performance of Provisionally and Professional Certified Beginning Teachers in Georgia, Final Report*. Athens, Georgia, University of Georgia, 1967.

Blosser, Patricia Ellen, "A Study of the Development of the Skill of Effective Questioning by Prospective Secondary School Science Teachers" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1970)

Blumberg, Arthur and Wilford Weber. "Teacher Morale as a Function of Perceived Supervisor Behavioral Style." *The Journal of Educational Research*, Vol. 62, No. 3, 1968.

Brewington, William C., "A Study of First Year Secondary School Science Teachers Who Completed Preservice Programs at The Ohio State University" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1971)

Brodie, T. A., Jr. "Attitude Toward School and Academic Achievement." *Personnel and Guidance Journal*, Vol. 43, 1964, pp. 375-378.

Brottman, Marvin A. *Innovations in Teacher Education?* ERIC Document Reproduction Service, 1972. ED061152

Brown, William R., "Teacher Competencies and Characteristics in Science Preservice Teacher Education Project" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1972)

Brown, William R. "Experience-Based Science and Mathematics Preservice Teacher Education Program." Science Education, Vol. 57, No. 4, 1973.

Bruce, Larry Rhea. "A Determination of the Relationships Among SCIS Teachers' Personality Traits, Attitude Toward Teacher-Pupil Relationship, Understanding of Science Process Skills and Question Types." Dissertation Abstracts, Vol. 30, No. 11, Part A, 1970.

Butler, Thomas Albert, "A Descriptive Study of Teacher Verbal Behavior in an Inquiry Approach Laboratory-Oriented Secondary Science Course" (unpublished Doctor's dissertation, University of Rochester, Rochester, New York, 1971)

Butts, David P. and Chester E. Raun. "A Study of Teacher Change." Science Education, Vol. 53, No. 1, 1969.

Campbell, J. P. et al. Managerial Behavior, Performance, and Effectiveness. New York, McGraw-Hill, 1970.

Cartwright, D. and A. Zander (eds.) Group Dynamics: Research and Theory. Evanston, Illinois, Row, Peterson, 1953.

Chung, Ki-suck. Teacher Centered Management Style of Public School Principals and Job Satisfaction of Teachers. Department of Education, Bureau of Research, Michigan, 1970.

Cignetti, Jess Anthony, "A Comparative Study of the Perceptions of Beginning Secondary Science Teachers in Relationship to their Science Classroom Activities, Cultural Attitudes and Knowledge of Culturally Deprived Students" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1971)

Clothier, G. M. and J. H. Lawson. Innovation in the Inner City. Kansas City, Missouri, Mid-Continent Regional Educational Laboratory, 1969.

Coffey, Warren Chester. "Changes in Teachers' Verbal Classroom Behavior Resulting from an In-Service Program in Science Education." Dissertation Abstracts, Vol. 28, No. 11, Part A, 1968.

Cogan, M. L. "The Behavior of Teachers and the Productive Behavior of their Pupils: I. Perception Analysis." *Journal of Experimental Education*, Vol. 27, pp. 89 - 105, 1958.

Cohen, E. G. "Sociology and the Classroom: Setting the Conditions for Teacher-Student Interactions." *Review of Educational Research*, Vol. 42, pp. 441 - 452, 1972.

Colella, Anthony J., "Attitudes and Behaviors of Recent Graduates of the Experimental and Traditional Teacher Education Models at Seton Hall University" (unpublished Doctor's dissertation, Fordham University, New York, 1974)

Comeaux, Pamela Harris. *A Follow-Up Study of 1967-70 Cooperative Urban Teacher Education Graduates*. Kansas City, Missouri, Mid-Continental Regional Educational Laboratory, 1971. ED100925

Coyne, Charles E. *Comparative Analysis of Teacher Education*. St. Joseph, Missouri, Missouri Western College, 1970.

Cronbach, L. J. "The Two Disciplines of Scientific Psychology." *American Psychology*, Vol. 12, pp. 671 - 684, 1957.

Cruickshank, Donald R. and Frank W. Broadbent. *The Identification and Analysis of Problems of First Year Teachers*. ERIC Reproduction Service, 1965. ED013786.

Crumb, Glenn H. "Understanding of Science in High School Physics." *Journal of Research in Science Teaching*, Vol. 3, No. 3, 1965.

A Cybernetic Approach to Continuous Program Re-Conceptualization in Teacher Education Through Graduate Assessment. Fairmont, West Virginia, Fairmont State College, 1973. ED085378.

Cyphert, Frederick R. "An Analysis of Research in Teacher Education." *Journal of Teacher Education*, Vol. 23, No. 2, 1972. EJ065622.

Davis, Warren Maywood, "Factors of Effectiveness in Science Teaching and their Application to the Teaching of Science in Ohio's Public Secondary Schools" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1952)

Davis, Warren Maywood. "Factors of Effectiveness in Science Teaching and their Application to the Teaching of Science in Ohio's Public Secondary Schools." *Science Education*, Vol. 38, Feb. 1954.

Deamer, Thelma L. T. E., "The Perceptions of Individuals Involved in a Science Teacher Education Field Experience Program" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1973)

Disinger, John Franklin, "Student Development, Teacher Characteristics and Class Characteristics in Junior High School Science" (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1971)

Duncan, Darrel Gene, "A Product Evaluation of the Undergraduate Teacher Education Program at Portland State University" (unpublished Doctor's dissertation, University of Oregon, Eugene, Oregon, 1973)

Dysart, J. M. "A Study of the Effect of In-Service Training in Sociometry and Sociodrama on Teacher-Pupil Rapport and Social Climate in the Classroom." Dissertation Abstracts, Vol. 13, No. 1 1953.

Engelhardt, David Frederic, "Aspects of Spatial Influence on Science Teaching," (unpublished Doctor's dissertation, Harvard University, Cambridge Massachusetts, 1968) ED024214

Finkel, Maurice. "Factors Affecting the High School Students' Choice Regarding a Science Career." Science Education, Vol. 45, March, 1961.

Gage, N. L. "Paradigms for Research on Teaching." In N. L. Gage (Ed.) Handbook of Research on Teaching. Chicago, Rand McNally, 1963.

Getzels, J. W. and E. G. Guba. "Social Behavior and the Administrative Process." The School Review. Vol. LXV, No. 4, pp. 423 - 441, 1957.

Glick, O. "Sixth Graders' Attitudes Toward School and Interpersonal Conditions in the Classroom." Journal of Experimental Education, Vol. 38, pp. 17 - 22, 1970.

Goldberg, J. B. "Influence of Pupils' Attitudes on Perception of Teachers' Behaviors and on Consequent School Work." Journal of Educational Psychology, Vol. 59, pp. 1 - 5, 1968.

Gould, Orrin. "The Cooperative Teacher Education Project:Preservice Outcomes," paper presented at the National Association for Research in Science Teaching annual meeting, Chicago, Illinois, 1974. ED092363.

Gregersen, G. F. and R. M. W. Travers. "A Study of the Child's Concept of the Teacher." Journal of Educational Research, Vol. 61, pp. 324 - 327, 1968.

Grobman, Hulda. "Preliminary Report on the 1961-1962 Evaluation of New High School Biology Curriculum." Biological Sciences Curriculum Study Newsletter, February, 1963.

Grover, Burton L., Jerold King, Robert M. Thorndike. A Comparative Multivariate Analysis of Competency Based Teacher Education Programs. Bellingham, Washington, Western Washington State College, 1973.

Guba, Egon and Charles Bidwell. Administrative Relationships: Teacher Effectiveness, Teacher Satisfaction, and Administrative Effectiveness. Chicago, Midwest Administration Center, University of Chicago, 1957.

Hall, Gene E. "Teacher Pupil Behavior Exhibited by Two Groups of Second Grade Teachers Using Science - A Process Approach." Science Education, Vol. 54, No. 4, 1970.

Halpin, Andrew and Don Crofts. The Organizational Climate of Schools. United States Office of Education, SAE 543(8639), 1962.

Heath, Robert W. "Comparison of Achievement in Two Physics Courses." Journal of Experimental Education, Vol. 32, pp. 348 - 354, 1964.

Holmes, F. E., "The Effect of a Community Field Study on the Tolerant-Prejudice Attitude of Prospective Secondary Teachers Toward Negroes," (unpublished Doctor's dissertation, University of Denver, Denver, Colorado, 1968)

Howe, Robert Wilson, "The Relationship of Learning Outcomes to Selected Teacher Factors and Teaching Methods in Tenth Grade Biology Classes in Oregon," (unpublished Doctor's dissertation, Oregon State University, Corvallis, Oregon, 1964)

Howe, Robert W. and Gregor Ramsey. "An Analysis of Research on Instructional Procedures in Secondary School Science. Part I - Outcomes of Instruction." The Science Teacher, Vol. 36, No. 3, 1969.

Hughes, James Monroe. "A Study of Intelligence and of the Training of Teachers as Factors Conditioning the Achievement of Pupils," in Second Digest of Investigations in the Teaching of Science by Francis D. Curtis. New York, Teachers College Press, Columbia University, 1971.

Hunter, J. Scott. "The Beginning Teacher One Year Later: Report of a Follow-Up Study." Review of Educational Research, Vo. 37, No. 4, 1967.

Irwin, Roger Scott. "A Comparative Study of the Effect of Certain Factors on the Teaching Behavior of Preservice Elementary Teachers of Science." Dissertation Abstracts, Vol. 31, No. 11, Part A, 1971.

Khan, S. B. and Joel Weiss. "The Teaching of Affective Responses," in Second Handbook of Research on Teaching by Robert M. W. Travers (Ed.). Chicago, Rand McNally, 1973.

Khan, S. B. "Affective Correlates of Academic Achievement: A Longitudinal Study. Measurement and Evaluation in Guidance, No. 3, pp. 76 - 80, 1970.

Kleinman, Gladys S. "General Science Teachers' Questions, Pupil and Teacher Behaviors, and Pupils' Understanding of Science." Dissertation Abstracts, Vol. 25, No. 9, Part A, 1965.

Kochendorfer, Leonard. "A Comparative Study of the Classroom Practices and Teaching Rationale of High School Biology Teachers Using Different Curriculum Materials," (unpublished Doctor's dissertation, University of Texas, Austin, Texas, 1966)

Kochendorfer, Leonard H. "The Development of a Student Checklist to Determine Classroom Teaching Practices in High School Biology," in Research and Curriculum Development in Science Education, ed. Addison E. Lee, University of Texas, Austin, 1967.

Lahaderne, H. M. "Attitudinal and Intellectual Correlates of Attention: A Study of Four Sixth-Grade Classrooms." Journal of Educational Psychology, Vol. 59, pp. 320 - 324, 1968.

La Shier, William S. "Assessment of the AAAS Science - A Process Approach," paper presented at the National Association for Research in Science Teaching annual meeting, Minneapolis, Minnesota, 1970. ED037371.

Leeds, C. H. and W. W. Cook. "The Construction and Differential Value of a Scale for Determining Teacher-Pupil Attitudes." Journal of Experimental Education, Vol. 16, pp. 149 - 159, 1947.

Lewis, William A. "An Evaluation of Four Selected Approaches to Teaching High School Biology." Dissertation Abstracts, Vol. 27, No. 06A, 1966.

Lucy, Edward C., "An Evaluation of a Laboratory Science Program in a Professional Education Course for Prospective Secondary Science Teachers at The Ohio State University," (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1972)

Malpass, L. F. "Some Relationships Between Students' Perceptions of School and their Achievement." Journal of Educational Psychology, Vol. 44, pp. 475 - 482, 1953.

Marie, Sister Ernestine. "A Comparison of Inductive and Deductive Methods of Teaching High School Chemistry." Science Education, Vol. 45, pp. 436 - 443, 1961.

Morsh, Joseph E. and Eleanor W. Wilder. Identifying the Effective Instructor: A Review of the Quantitative Studies 1900 - 1952. Bethesda, Maryland, ERIC Document Reproduction Service, 1954. ED044371.

Maucker, J. W. "Imperatives for Excellence in Teacher Education," in A Decade of Thought on Teacher Education: The Charles W. Hunt Lectures. Washington, D. C., The American Association of Colleges for Teacher Education, 1969.

Mayer, Victor J. "A School and Research Focused Program for Preparing Earth Science Teachers." Journal of Geological Education, Vol. 22, No. 1, 1974.

Miller, Richard P. "How to Plan Science Facilities for the 70's." Nation's School, Vol. 89, No. 36, 1972.

Mitchell, DeWayne W., "Classifying Overt Pupil Behavior in the Classroom," (unpublished Doctor's dissertation, University of Kentucky, Lexington, Kentucky, 1967)

Moore, Jean R., "An Analysis of Teacher and Pupil Verbal Behavior and Teacher Procedural and Evaluative Behavior in Relation to Objectives Unique to the PSSC and Non-PSSC Curricula," (unpublished Doctor's dissertation, The University of Michigan, Ann Arbor, Michigan, 1968)

Morin, Gary Alan, "An Evaluation of the Pre-Service Education Laboratory Experience," (unpublished Doctor's dissertation, University of Montana, Bozeman, Montana, 1973)

Novak, Joseph D. Facilities for Secondary School Science Teaching: Evolving Patterns in Facilities and Programs. Washington, D. C., National Science Teachers Association, 1972.

Ost, David Harry. "An Analysis of the Effects of a Summer Institute in Biology Upon Teachers' Classroom Behavior and Attitude Towards BSCS Rationale." Dissertation Abstracts, Vol. 32, No. 3, Part A, 1971.

Payne, James Irwin. "Analysis of Teacher-Student Classroom Interaction in Amish and Non-Amish Schools Using Flanders Interaction Analysis Technique." Dissertation Abstracts, Vol. 32, No. 1, Part A,1971.

Peck, Robert F. and James A. Tucker. "Research on Teacher Education," in Second Handbook of Research on Teaching, ed. Robert M. W. Travers, Chicago, Rand, McNally, 1973.

Perkes, Victor A. "Junior High School Science Teacher Preparation, Teaching Behaviors, and Student Achievement." Journal of Research in Science Teaching, Vol. 5, No. 2, 1967.

Perkes, Victor A. "Preparing Prospective Teachers of Elementary Science: An Appraisal Between Prescriptive Involvement and Teaching Behavior." Science Education, Vol. 55, No. 3, 1971.

Peruzzi, William T., "Science Department Head Supervisory Styles and their Affective Correlates," (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1972)

Petit, Virginia M. "An Analysis of the Teaching Behaviors of PSSC and Non-PSSC Physics Teachers and their Effect on Student Cognitive Achievement in Physics and Student Understanding of the Process of Science." Dissertation Abstracts, Vol. 30, No. 5, Part A, 1969.

Pizzini, Edward Leon, "An Analysis of the Effects of an Undergraduate Pre-Service Teacher Education Program on Selected Personal Characteristics," (unpublished Doctor's dissertation, University of Iowa, 1972) ED089976.

Pryor, Guy, "The Relationship Between Teacher's Perception of Administrative Dimensions and the Morale Status of Teachers in Certain Texas Schools," (unpublished Doctor's dissertation, North Texas State University, 1964).

Rainey, Robert G. "A Comparison of the CHEM Study Curriculum and a Conventional Approach in Teaching High School Chemistry." *School Science and Mathematics*, Vol. 64, pp. 539 - 541, 1964.

Ramsey, Gregor A. and Robert W. Howe. "An Analysis of Research on Instructional Procedures in Secondary School Science Part II - Instructional Procedures." *The Science Teacher*, Vol. 36, No. 4 1969(a).

Ramsey, Gregor A. and Robert W. Howe. "An Analysis of Research Related to Instructional Proceddures in Elementary School Science." *The Science Teacher*, Vol. 36, No. 4, 1969(b).

Rogers, Robert Earl, "Classroom Verbal Behavior as Related to Teachers' Perception of Pupils in Fifth Grade Science Classes," (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1970)

Richardson, Richard, Jr. and Clyde Blocker. "Note on the Application of Factor Analysis to the Study of Faculty Morale." *Journal of Educational Psychology*, Vol. 54, No. 4, 1963.

Ryans, David G. *Characteristics of Teachers*. Washingtin, D. C., American Council on Education, 1960.

Sagness, Richard Lee, "A Study of Selected Outcomes of a Science Pre-Service Teacher Education Project Emphasizing Early Involvement in Schools of Contrasting Environmental Settings," (unpublished Doctor's dissertation, The Ohio State University, Columbus, Ohio, 1970)

Salomon, G. "Heuristic Models for the Generation of Aptitude-Treatment Interaction Hypotheses." *Review of Educational Research*, Vol. 42, pp. 321 - 343, 1972.

Sandefur, J. T. et al. *Teaching Experience as a Modifier of Teaching Behavior.* U. S. Department of HEW, Office of Education, No. 8-f-027, 1969.

Sandefur, J. T. and others. *An Experimental Study of Professional Education for Secondary Teachers: Final Report.* Emporia, Kansas, Kansas State Teachers College, 1967.

Sandefur, J. T. *An Illustrated Model for the Evaluation of Teacher Education Graduates.* Washington, D. C., American Association of Colleges for Teacher Education, 1970.

Schirner, S. "A Comparison of Student Outcomes in Various Earth Science Courses Taught by 17 Iowa Teachers," paper presented at the National Association for Research in Science Teaching annual meeting, 1968.

Schlessinger, Fred R. et al. *A Survey of Science Teaching in Public Schools of The United States (1971) Vol. 1 - Secondary Schools.* Columbus, Ohio, Center for Science and Mathematics Education, The Ohio State University, 1973.

Sherwin, Susan. *Teacher Education: A Status Report.* Washington, D. C., American Association of Colleges for Teacher Education, 1974. ED096287

Soptick, John M. and Grant M. Clothier. *CUTE Installation and Diffusion Project. Second Phase. Final Report.* Kansas City, Missouri, Mid-Continent Regional Educational Laboratory, 1974. ED095171.

Spangenberg, Walter Joseph, "An Analysis of the Verbal Interactions of College Students as they Work in a Zoology Laboratory and a Correlation of their Behavior with their Academic Achievement and Attitudes," (unpublished Doctor's dissertation, University of Northern Colorado, 1970)

Standards for Accreditation of Teacher Education. Washington, D. C., The National Council for Accreditation of Teacher Education, 1970.

Stone, Douglas E. "Measured Stability of Teacher Personality." *Psychological Reports*, Vol. 16, pp. 1293 - 1302, 1965.

Sweat, Joseph P., "Authoritarian - Democratic Personality Traits of High School Principals and Teacher Morale," (unpublished Doctor's dissertation, University of Arkansas, 1963)

Tannenbaum, R. and W. H. Schmidt. "How to Choose a Leadership Pattern." Harvard Business Review, Vol. 36, pp. 95 - 101, 1958.

Tanenbaum, S. "Attitudes of Elementary School Children to School, Teachers, and Classmates." Journal of Applied Psychology, Vol. 28, pp. 134 - 141, 1944.

Teacher Education and School Service Personnel Programs at The Ohio State University, Volume I. Columbus, Ohio, The Ohio State University, 1974.

Trowbridge, Leslie W. "Secondary Science Teacher Education: Where Are We Going," in Secondary Science Teacher Education: Where Are We Going, ed. John F. Schaff et al., Columbus, Ohio, ERIC Science, Mathematics and Environmental Education Clearinghouse, 1974.

Troxel, Verne A. Analysis of Instructional Outcomes of Students Involved with Three Courses in High School Chemistry. U. S. Department of Health, Education, and Welfare, Office of Education, 1968.

Vickery, Robert Lyn. "An Examination of Possible Changes in Certain Aspects of Teacher Behavior Resulting from the Adoption of Individualized Laboratory-Centered Instructional Materials." Dissertation Abstracts, Vol. 30, No. 2, Part A, 1969.

Wass, Hannelore and Arthur W. Combs. "Humanizing the Education of Teachers." Theory into Practice, Vol. 13, No. 2, 1974.

Westmeyer, Paul, et al. A Comparison of Various Techniques for the Dissemination of a New Science Curriculum in Florida. Washington, D. C.,U. S. Department of Health, Education and Welfare, Office of Education, and Florida State University, 1967.

Wiegand, Regis Barry. "The Effectiveness of a Video-Tape Model in Developing Supportive Teacher Behaviors." Dissertation Abstracts, Vol. 21, No. 1, Part A, 1970.

Wilborn, Bobbie LaRue. "The Relationship Between Teacher Attitudes and Teacher Ratings of Pupil Behavior." Dissertation Abstracts, Vol. 32, No. 9, Part A, 1972.

Williamson, Stanley E., "Personal Problems of Teachers Influencing Classroom Teacher-Pupil Relationships," (unpublished Doctor's dissertation, University of Oregon, Eugene, Oregon, 1956)

APPENDIX A

REFERENCES FOR COMPUTER PROGRAMS USED

REFERENCES FOR COMPUTER PROGRAMS USED

1. BMD BIOMEDICAL COMPUTER PROGRAMS
W. J. Dixon (editor), University of California Press, Berkeley. 1970.

BMD01D	Simple Data Description
BMD02D	Correlation with Transgeneration
BMD02R	Stepwise Regression
BMD01V	Analysis of Variance for One-Way Design

2. BMD BIOMEDICAL COMPUTER PROGRAMS X-SERIES SUPPLEMENT
W. J. Dixon (editor), University of California Press, Berkeley. 1970.

BMDX72	Factor Analysis

3. MULTIVARIATE ANALYSIS OF VARIANCE ON LARGE COMPUTERS
Dean J. Clyde, Clyde Computing Service, Miami. 1969.

MANOVA	Multivariate Analysis of Variance

4. FORTAP A FORTRAN TEST ANALYSIS PACKAGE.
Dan Bauman, State University College, Fredonia, New York, 1973.

FORTAP (RAVE)

APPENDIX B

LIST OF ALL VARIABLES USED

LIST OF ALL VARIABLES USED

1. Teacher's age in years.

2. Teacher's marital status.
   Single = 1
   Married = 2

3. Sex of teacher.
   Male = 1
   Female = 2

4. Degree held by teacher (B.S., B.A.)
   None = 0
   Yes = 1
   Dual degree = 2

5. Degree held by teacher (M.A., M.S., M.Ed.)
   None = 0
   Yes = 1
   Dual degree = 2

6. Teacher working on formal degree program.
   No = 0
   Yes = 1

7. If "yes" to #6, what degree?
   Academic = 1
   Professional = 2

8. Teacher exposure to curriculum projects.
   No = 0
   Yes = 1

9. Teacher participation in science course improvement projects.
   None = 0
   If only 1 workshop = 1
   If 2 = 2
   More than 2 = 3

10. Teacher participation in workshop with materials only.
    No = 0
    Yes = 1

11. Teacher participation in workshop with materials and students.
    No = 0
    Yes = 1

12. Teacher's feelings toward time class meets.
    Strongly dislike = 1
    Dislike = 2
    Satisfactory = 3
    Like = 4
    Strongly like = 5

13. Teacher's feelings toward students in group.
    Strongly dislike = 1
    Dislike = 2
    Satisfactory = 3
    Like = 4
    Strongly like = 5

14. Teacher's feelings toward curriculum materials used.
    Strongly dislike = 1
    Dislike = 2
    Satisfactory = 3
    Like = 4
    Strongly like = 5

15. Teacher's feelings toward classroom facilities.
    Strongly dislike = 1
    Dislike = 2
    Satisfactory = 3
    Like = 4
    Strongly like = 5

16. Teacher's feelings toward grading and reporting.
    Strongly dislike = 1
    Dislike = 2
    Satisfactory = 3
    Like = 4
    Strongly like = 5

17. Number of students in class.
    More than 40 = 1
    36 - 40 = 2
    31 - 35 = 3
    26 - 30 = 4
    21 - 25 = 5
    16 - 20 = 6
    11 - 15 = 7
    0 - 10 = 8

18. Number of periods per day teacher teaches.
    6 - 7 = 1
    4 - 5 = 2
    1 - 3 = 3

19. Number of periods per week teacher teaches.
    26 - 35 = 1
    16 - 25 = 2
    1 - 15 = 3

20. Number of subjects taught.
    3 = 1
    2 = 2
    1 = 3

21. Relation of subjects teacher taught to major/minor.
    None = 0
    Related = 1

22. Did teacher use a national curriculum project?
    No = 0
    Yes = 1

23. Date of publication of text used by teacher.
    Before 1960 = 1
    1961 - 65 = 2
    1966 - 69 = 3
    1970 - 72 = 4
    1973 - 74 = 5

24. Full-time teaching experience in years.
    1 = 1
    2 = 2
    3 = 3
    4 = 4
    5 = 5
    6 = 6
    7 = 7
    8 = 8
    9 and more = 9

25. Actual support of teacher given by principal/supervisor.
    Not relevant = 1
    Expected to fulfill reasonable and average role = 2
    Able to develop uniqueness within limits = 3
    Free to develop course within existing legal limits = 4

26. Teacher's view of what should be done (if anything) by administration concerning classroom climate relating to student teacher interaction.
    Not relevant = 1
    Principal/supervisor should identify weaknesses and formulate plans for improvement = 2
    Principal/supervisor should provide help when or if teacher requests it = 3
    Principal/supervisor helps teacher identify areas of concern and actively works toward improvement = 4

27. Teacher's feelings about what should be done (if anything) by administration concerning handling of student discipline problems by science teacher.
    Not relevant = 1
    Principal/supervisor should identify weaknesses and formulate plans for improvement = 2
    Principal/supervisor should provide help when or if teacher requests it = 3
    Principal/supervisor helps teacher identify areas of concern and actively works toward improvement = 4

28. Teacher's feelings about what should be done (if anything) by administration concerning teacher using a variety and balance of instructional techniques.
    Not relevant = 1
    Principal/supervisor should identify weaknesses and formulate plans for improvement = 2
    Principal/supervisor should provide help when or if teacher requests it = 3
    Principal/supervisor helps teacher identify areas of concern and actively works toward improvement = 4

29. Teacher's view of actual action taken by administration concerning classroom climate.
    Not relevant = 1
    Principal/supervisor identifies weaknesses and formulates plans for improvement = 2
    Principal/supervisor provides help when or if teacher requests it = 3
    Principal/supervisor helps teacher identify areas of concern and actively works toward improvement = 4

30. Teacher's view of actual action taken by administration concerning handling of student discipline problems.
    Not relevant = 1
    Principal/supervisor identifies weaknesses and formulates plans for improvement = 2
    Principal/supervisor provides help when or if teacher requests it = 3
    Principal/supervisor helps teacher identify areas of concern and actively works toward improvement = 4

31. Teacher's view of actual action taken by administration concerning teacher's using a variety and balance of instructional techniques.
    Not relevant = 1
    Principal/supervisor identifies weaknesses and formulates plans for improvement = 2
    Principal/supervisor provides help when or if teacher requests it = 3
    Principal/supervisor helps teacher identify areas of concern and actively works toward improvement = 4

32. Teacher's appraisal of level of particular class used for study: advanced.
    No = 0
    Yes = 1

33. Teacher's appraisal of level of particular class used for study: regular.
    No = 0
    Yes = 1

34. Teacher's appraisal of level of particular class used for study: modified.
    No = 0
    Yes = 1

35. Student's age in years.

36. Student's grade level in school.
    Seventh = 1
    Eighth = 2
    Ninth = 3
    Tenth = 4
    Eleventh = 5
    Twelfth = 6

37. Sex of student.
    Male = 1
    Female = 2

38. Number of years of science student has taken including seventh grade and this year.
    1 = 1
    2 = 2
    3 = 3
    4 = 4
    5 = 5
    6 = 6

39. Final grade student received in last science course.
    F = 1
    D = 2
    C = 3
    B = 4
    A = 5

40. Does student like science?
    No = 1
    Yes = 2

41. Does student like this science course?
    No = 1
    Yes = 2

42. Does student enjoy assignments (class or home) given by present science teacher?
    No = 1
    Yes = 2

43. Is this student's best science course so far?
    No = 1
    Yes = 2

44. Adult occupation preferred by student.
    Non-science = 1
    Science = 2
    Teacher = 3

45. Is student interested in becoming a scientist, engineer or science teacher?
    No = 0
    Yes = 1

46. If "yes" to #45 what career choice would student make.
    Scientist = 1
    Engineer = 2
    Science teacher = 3

47. Brother was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

48. Mother was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

49. Father was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

50. Teacher was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

51. Sister was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

52. Friend was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

53. Self was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

54. Counsellor was most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

55. Relative most influential person in developing student's interest in scientific career.
    No = 0
    Yes = 1

56. Another person or factor was most influential in developing student's interest in scientific career.
    No = 0
    Yes = 1

57. Student's interest in another career greater than an interest in science.
    No = 0
    Yes = 1

58. Student would not pick a career in science because science is too difficult for him.
    No = 0
    Yes = 1

59. Student would not choose a scientific career because scientists are peculiar people.
    No = 0
    Yes = 1

60. Student would not choose a scientific career because math is difficult for him.
    No = 0
    Yes = 1

61. Student would not choose a scientific career because can't make much money.
    No = 0
    Yes = 1

62. Student would not choose a scientific career because of reasons other than mentioned.
    No = 0
    Yes = 1

63. Administrator's age in years.

64. Administrator's years of work in present position, including current year.
    1 = 1
    2 = 2
    3 = 3
    4 = 4
    5 = 5
    6 = 6
    7 = 7
    8 = 8
    9 and more = 9

65. Administrator last attended school for academic or professional preparation.
    1950-60 = 1
    1961-65 = 2
    1966-69 = 3
    1970-72 = 4
    1973-74 = 5

66. Administrator feels purpose of teaching science in his school should be understanding facts, principles and laws.
    No = 0
    Yes = 1

67. Administrator feels purpose of teaching science in his school should be development of laboratory techniques.
    No = 0
    Yes = 1

68. Administrator feels purpose of teaching science in his school should be development of critical thinking.
    No = 0
    Yes = 1

69. Administrator feels purpose of teaching science in his school should be development of scientific attitude.
    No = 0
    Yes = 1

70. Administrator feels purpose of teaching science in his school should be understanding the nature of science.
    No = 0
    Yes = 1

71. Administrator feels purpose of teaching science in his school should be development of creativity.
    No = 0
    Yes = 1

72. Administrator feels purpose of teaching science in his school should be other than those previously mentioned.
    No = 0
    Yes = 1

73. Administrator feels lecturing is the most important strategy for teaching science.
    No = 0
    Yes = 1

74. Administrator feels the lecture-discussion strategy is the most important for teaching science.
    No = 0
    Yes = 1

75. Administrator feels demonstrations are the most important strategy for teaching science.
    No = 0
    Yes = 1

76. Administrator feels instructional films are the most important strategy for teaching science.
    No = 0
    Yes = 1

77. Administrator feels laboratory activities are the most important strategy for teaching science.
    No = 0
    Yes = 1

78. Administrator feels excursions or field study are the most important strategy for teaching science.
    No = 0
    Yes = 1

79. Administrator feels programmed instruction is the most important strategy for teaching science.
    No = 0
    Yes = 1

80. Administrator feels independent study is the most important strategy for teaching science.
    No = 0
    Yes = 1

81. Administrator feels some strategy not previously mentioned is the most important for teaching science.
    No = 0
    Yes = 1

82. Administrator's view of what should be a science teacher's disciplinary ability.
    Authoritarian, atmosphere tense, classroom very quiet = 1
    Unsuccessful in attempts to control class, restlessness, inattention, noisy = 2
    Order restored if necessary with occasional word or look, room quiet, teacher aware of minor lapses = 3
    Students free, natural, self-governing, actively interested in and busy with work = 5

83. Administrator's view of what should be a science teacher's attitude toward adolescents.
    Ill at ease with them = 1
    Views them as "miniature adults" and expects too much or too little = 2
    Evaluates by adult standards on principle of they "just need to grow up," lacks understanding of feelings or opinions = 3
    Interested, recognizes their potentialities but ineffectual to help them develop them = 4
    Friendly, understanding, enjoys them, regards them objectively = 5

84. Administrator's view of what should be a science teacher's understanding of adolescents with behavior problems.
    Punishes all who misbehave, lacks understanding of reasons, considers shy quiet students "perfect" = 1
    Unaware that they have problems, any misbehavior consistently and always punished = 2
    Aware that there may be reasons for behavior that is unacceptable but does not relate to adolescents and punishes thoughtlessly = 3
    Wants students to behave even if problems exist, will punish but tries to look for reasons = 4

Wants to know why they act as they do, from the too quiet to the misbehavior, tries to solve problems = 5

85. Administrator's picture of type of encouragement he gives his science teachers.
    Do not know = 1
    Meet accepted expectations of local situation, his training and school policy = 2
    Encourage development of unique potentialities within broad limits = 3
    Teacher free to proceed on own within legal limitations = 4

86. Administrator's view of what his approach should be concerning the classroom climate relating to teacher-student interaction.
    Do not know = 1
    Should identify teacher's weaknesses and form plans for improvement and make suggestions = 2
    Should make teacher responsible for requesting help and provide it if so requested = 3
    Should help teacher identify and clarify areas of concern to teacher and with teacher formulate plans for improvement or implementation = 4

87. Administrator's view of what his approach should be concerning handling student discipline problems by teacher.
    Do not know = 1
    Should identify teacher's weaknesses and form plans for improvement and make suggestions = 2
    Should make teacher responsible for requesting help and provide it if so requested = 3
    Should help teacher identify and clarify areas of concern to teacher and with teacher formulate plans for improvement or implementation = 4

88. Administrator's view of what his approach should be concerning teacher's using a variety and balance of instructional techniques.
    Do not know = 1
    Should identify teacher's weaknesses and form plans for improvement and make suggestions = 2
    Should make teacher responsible for requesting help and provide if is so requested = 3
    Should help teacher identify and clarify areas of concern to teacher and with teacher formulate plans for improvement or implementation = 4

89. Preparation room
    No = 0
    Yes = 1
    Outstanding = 2

90. Teacher's office space.
    No = 0
    Yes = 1
    Outstanding = 2

91. Multi-purpose room.
    No = 0
    Yes = 1
    Outstanding = 2

92. Plant growth area.
    No = 0
    Yes = 1
    Outstanding = 2

93. Storage space.
    No = 0
    Yes = 1
    Outstanding = 2

94. Sinks.
    No = 0
    Yes = 1
    Outstanding = 2

95. Cold water outlets.
    No = 0
    Yes = 1
    Outstanding = 2

96. Hot water outlets.
    No = 0
    Yes = 1
    Outstanding = 2

97. Gas outlets.
    No = 0
    Yes = 1
    Outstanding = 2

98. Compressed air outlets.
    No = 0
    Yes = 1
    Outstanding = 3

99. Electrical outlets.
    No = 0
    Yes = 1
    Outstanding = 2

100. Microscopes.
    No = 0
    Yes = 1
    Outstanding = 2

101. Refrigerator.
    No = 0
    Yes = 1
    Outstanding = 2

102. Glassware.
    No = 0
    Yes = 1
    Outstanding = 2

103. Basic laboratory equipment.
    No = 0
    Yes = 1
    Outstanding = 2

104. Basic laboratory chemicals.
    No = 0
    Yes = 1
    Outstanding = 2

105. Globes.
    No = 0
    Yes = 1
    Outstanding = 2

106. Specimen.
    No = 0
    Yes = 1
    Outstanding = 2

107. Other teaching aids for demonstration, etc.
    No = 0
    Yes = 1
    Outstanding = 2

108. Funds for perishables, glassware, chemicals and specimens.
    No = 0
    Yes = 1
    Outstanding = 2

109. Laboratory assistants.
    No = 0
    Yes = 1
    Outstanding = 2

110. Permitted to go outside school grounds.
    No = 0
    Yes = 1
    Outstanding = 2

111. Transportation facilities.
    No = 0
    Yes = 1
    Outstanding = 2

112. Funds made available if needed.
    No = 0
    Yes = 1
    Outstanding = 2

113. Major: biology.
    No = 0
    Yes = 1

114. Major: comprehensive science/general science.
    No = 0
    Yes = 1

115. Major: earth science.
    No = 0
    Yes = 1

116. Major: physical science.
    No = 0
    Yes = 1

117. CAST: Pupil Perceptions (Teacher-pupil relationship). Sub-score A.

118. CAST: Pupil Perceptions (Type of classroom activities). Sub-score B.

119. CAST: Pupil Perceptions. Total.

120. CAST: Supervisor's Perceptions (Teacher-pupil relationship). Sub-score A.

121. CAST: Supervisor's Perceptions (Type of classroom activities). Sub-score B.

122. CAST: Supervisor's Perceptions (Personal adjustment). Subscore C.

123. CAST: Supervisor's Perceptions. Total.

124. SCACL: Teacher's Perceptions (Composite score) Inservice.

APPENDIX C

INSTRUMENTS

Instructions for Administering the Instruments

Administrator's Questionnaire

Teacher Questionnaire

Student Questionnaire

Facilities Checklist

Checklist for Assessment of Science Teachers: Pupil's Perceptions

Checklist for Assessment of Science Teachers: Supervisor's Perceptions

Science Classroom Activity Checklist: Teacher's Perceptions

INSTRUCTIONS FOR ADMINISTERING THE INSTRUMENTS

The following instruments have been included in the packet:

(a) To be completed by students in any single science class

1. Student Questionnaire (answers to be written on the questionnaire itself)
2. Checklist for Assessment of Science Teachers:Pupils Perceptions (to be answered on the computer scored response sheets)

(b) To be completed by the science teachers participating in the study

1. Teacher Questionnaire (answers to be written on the questionnaire itself)
2. Science Classroom Activity Checklist: Teacher's Perceptions (to be answered on the computer scored answer sheet)
3. Facilities Checklist (check your answers on the questionnaire) (In some cases it has already been done by the investigator during his visit to the school)

WHEN to administer .... any day during April 21- May 16, 1975

HOW to adminster the pupil instruments..... ......

1. Select any one of your science classes for this purpose. Same students should complete both the instruments.
2. On the appointed day tell students the following before the administration: " I have two small questionnaires which you will be asked to complete. On one questionnaire (hold Student's Questionnaire high in hand) you are asked to give us some information about your interest in science. The second questionnaire (show the Checklist for ....Pupil Perceptions or CAST:PP high in your hand) is designed to ask your opinions about what we do in this class and what type of behavior can be seen between teacher and students. The answer to the first questionnaire should be written on the questionnaire itself, but answers to the second questionnaire need to be given on the enclosed computer scored sheet. You can complete these in any order. Please read the directions on top of these questionnaires. You are not required to write your names on these. Remember when you use the computer sheet use only black no. 2 pencil and the answers will be given for first ten questions only in the appropriate places. If you have to erase any thing please do so completely."

You may have to explain the procedure for the response sheets. Please do so. When distributing the CAST:PP, it might be good idea to slip the computer sheet in it.

3. When the students are done please collect the questionnaires and the response sheets.
4. If individuals need help in trying to understand the procedure or in extreme cases meanings for some words used in the questionnaires, please do so exercising your own judgement.

Teacher questionnaires need to be completed by the participating teachers separately. Use the computer sheet for your responses on SCACL:TP. The other one or two (depending on the situation) questionnaires can be completed on the original sheets.

MAILING INSTRUCTIONS

Include the response sheets (for SCACL:TP,Teacher's Questionnaire, Student Questionnaire, and CAST:PP, and Facilities Checklist) and mail them in the enclosed envelope. The address on this should be as follows:

The Ohio State University
Center for Science and Mathematics Education
244 Arps Hall
1945 North High Street
Columbus OH 43210

Attn. Piyush Swami

ADMINISTRATOR'S QUESTIONNAIRE

Directons: This questionnaire is designed to seek your views on different aspects of science teaching in schools and your role in it. All the information collected will be kept confidential. Please feel free to add any further comments on a separate sheet.

1. Name ______________________ 2. Position __________

3. School ______________________________________

4. Age __________

5. Number of years in your present position (count this year as one) ________

6. Last school attended for academic or professional preparation

School ______________________ Year ________

Purpose (specify)
______ Degree ________
______ Diploma ________
______ Certificate ________
______ Refresher Course ________
______ Other ________

Rank order the three items in each questions # 7 and 8 that you think are most important for a science teacher. Use 1,2, and 3 designations, 1 being most important and 3 being least important.

7. The purpose of teaching science in (your) school should be:

________ Understanding facts, principles, and laws
________ Development of laboratory techniques
________ Development of critical thinking
________ Development of scientific attitude
________ Understanding the nature of science
________ Development of creativity
________ Other (specify) ____________________

8. The most important strategies for teaching science are:

________ Lecture
________ Lecture-discussion
________ Demonstrations
________ Instructional films
________ Laboratory activities
________ Excursions or field study
________ Programmed instruction
________ Independent study
________ Other (specify) ____________________

9. What should characterize the science teacher's disciplinary ability? (Circle)

   a. The teacher makes the students feel free and natural. They are actively interested in and busy with school work. They are able to govern themselves.

   b. The teacher sees to it that work proceeds with little or no interruption. The students are usually attentive to the task at hand.

   c. The teacher is able to restore "order" with an occasional reprimand or warning look. The room is fairly quiet; there is some whispering and inattention. The teacher is usually sensitive to minor lapses of conduct.

   d. The teacher attempts but is unable to control his class. Students in his classroom appear restless. There is considerable inattention and noisy behavior.

   e. The teacher is an authoritarian who "rules with an iron hand." An atmosphere of nervousness and tenseness persists. The classromm is exceptionally quiet. The students do not respect the teacher.

10. What should characterize the science teacher's attitude toward adolescents?(Circle

    a. The teacher regards the adolescent objectively for what he is. The teacher is friendly and understanding. The teacher likes adolescents and enjoys having them around. He listens to the opinions of adolescents.

    b. The teacher understands that adolescents have potentialities for development, but he does little to help them develop these potentialities. The teacher expresses the desire to know adolescents better.

    c. The teacher often does not try to understand the feelings or opinions of adolescents. He thinks adolescents "just need to grow up." The teacher evaluates adolescents by adult standards rather than by what the adolescents can do.

    d. The teacher views the adolescents as a "miniature adult." He tends to to expect too much or too little of adolescents.

    e. The teacher does not try to understand adolescents. He is not interested in the opinions of adolescents. He is often ill at ease or uncomfortable when adolescents are with him.

11. What should characterize the science teacher's understanding about adolescents with behavior problems? (Circle)

    a. The teacher is not as concerned about adolescents who misbehave in class as he is about adolescents who are "too quiet." He tries to find reasons why adolescents act as they do, and he tries to help them solve their problems.

    b. The teacher is aware that adolescents have problems. He looks for reasons why adolescents misbehave. The teacher expects students to behave even if they have problems, and he will punish them if necessary.

c. The teacher usually is not aware that adolescents have reasons for their actions. He knows he should learn something about the background of adolescents, but he often punishes instead.

d. The teacher is not aware that adolescents have problems. He treats all adolescents who misbehave the same way. He always punishes them.

e. The teacher thinks adolescents who are disobedient are the most serious problems. He thinks the shy, quiet adolescents are the "perfect students." He does not try to understand the reasons for the actions of adolescents. He punishes all adolescents who misbehave.

12. Which best describes the type of encouragement you give science teachers?

(Consider the study sample teacher/s only. Circle the response.)

a. feel free to do pretty much what you want to do within your own classroom providing you stay within the existing legal constraints.

b. develop your unique potentialities within broad limits determined by such things as articulation of your courses with the rest of the science curriculum.

c. fulfill the role-expectations of your position as defined by the local school committeee, your professional training, and the philosophy and policies of the school.

d. do not know or does not apply.

Use the response choices to answer the items 13-15. Circle the letter on the left representing your best response to each item. For each item respond to the question, "Which approach should you use..................?"

Response Choices:

a. The administrator should help the science teacher identify and clarify the areas of concern to the science teacher and then work with him to formulate plans for improvement and/or implementation.
b. The administrator should make the science teacher responsible for determining whether improvement is desirable, providing help when and if the science teacher asks for it.
c. The administrator should identify the science teacher's weaknesses and formulate plans for his improvement, perhaps making suggestions for implementing the improvement plans.
d. Do not know or does not apply.

---

a b c d 13. .... concerning the classroom climate that exists due to the interaction of the science teacher and his students?

a b c d 14. .... concerning the handling of student discipline problems by the science teacher?

a b c d 15. ....concerning the science teacher using a variety and balance of instructional techniquesin the teaching of science?

Teacher Questionnaire

Directions:

This questionnaire is to seek some information about your academic preparation and the teaching load. All the information collected will be kept confidential and treated in a professional manner. Please feel free to include any additional comments which may be helpful.

1. Name________________________________ 2. School__________________________
   Last First

TEACHER CHARACTERISTICS (Check or fill in the blank spaces provided)

3. Age in years __________

4. Marital Status: Single_____ Married_______

5. Sex: Female_____ Male_____

6. Please specify the degree (s) you now hold, and the major and minor subject fields of the degree (s):

	Major	Minor	Institution	Year
A. B.S., B.A.				
B. M.A., M.S., M. ED.				

7. Are you working on a formal degree program? Yes_____ No______

   If yes, what degree? __________ Major: ______________ Minor:____________

8. If you have been exposed to any of the science course improvement projects in your undergraduate (UG) or graduate (G) education, please check the appropriate position below. (Examples of course improvement projects: IPS, ISCS, ESCP, SSSP, CHEM Study, CBA, PSSC, HPP, Portland Project)

Science course improvement project	Workshop with materials		Workshop with materials and students	
	C	UG	C	UG

9. Please check the following keeping into consideration the class being used for this study.

	Strongly Like	Like	Satisfactory	Dislike	Strongly dislike
a. When the class meets in the school.					
b. The Students in the group.					
c. Curriculum Materials used.					
d. Classroom facilities					
e. Grading and Reporting					

10. Answer the following for the particular class used for this study

a. Advanced/Regular/Modified ____________________

b. No. of students ________________

11. Total number of teaching periods

a. per day ____________

b. per week ____________

12. How many subjects do you teach? (please specify)

13. Are you using any national curriculum project? ___Yes ___No

14. Please specify the textbook and/or materials being used in your teaching

Title	Author	Year of Publication

15. Number of years of full time teaching experience (count this year)

A. Secondary level ________

B. College ________

C. Other (specify) ________

TOTAL ________________

16. Please make any comments regarding your pre-service teacher education program at The Ohio State University.

Teacher Questionnaire continued

17. Which best describes the type of encouragement your principal/supervisor gives you? Please circle your choice.

    a. feel free to do pretty much what you want to do within your own classroom providing you stay within the existing legal constraints

    b. develop your own unique potentialities within broad limits determined by such things as articulation of your courses with the rest of the science curriculum

    c. fulfill the role-expectations of your position as defined by the local school committee, your professional training, and the philosophy and policies of the school

    d. do not know or does not apply.

Your responses to items 18-20 indicate what you feel should be done in your school to best achieve the goals of the science program. Use the response choices below to answer these items. Circle the letter on the left representing your best response to each item. For each item respond to the question,"Which approach should the principal/ supervisor use............?

Response choices:

a. The principal/supervisor should help the science teacher identify and clarify the areas of concern to the science teacher and then work with him to formulate plans for improvement and /or implementation.

b. The principal/supervisor should make the science teacher responsible for determining whether improvement is desirable, providing help when and if the science teacher asks for it.

c. The principal/supervisor should identify the science teacher's weaknesses and formulate plans for his improvement, perhaps making suggestions for implementing the improvement plans.

d. do not know or does not apply.

---

a b c d 18. ....concerning the classroom climate that exists due to the interaction of the science teacher and his students?

a b c d 19. ....concerning the handling of student discipline problems by the science teacher?

a b c d 20. ....concerning the science teacher using a variety and balance of instructuional techniques in the teaching of science?

contd.

Your responses indicate what is done in your school. Use the response choices below to answer the items 21-23. Circle the letter on the left representing your best choice for each item. For each item, respond to the question, "Which approach does your principal/supervisor use.........?

Response choices:

a. The principal/supervisor helps the science teacher identify and clarify the areas of concern to the science teacher and then works with him to formulate plans for improvement and/or implementation.

b. The principal/supervisor makes the science teacher responsible for determining whether improvement is desirable, providing help when and if the science teacher asks for it.

c. The principal/supervisor identifies the science teacher's weaknesses and formulates plans for his improvement, perhaps making suggestions for implementing the improvement plans.

d. do not know or does not apply.

---

a b c d 21. ....concerning the classroom climate that exists due to the interaction of the science teacher and his students?

a b c d 22. ....concerning the handling of student discipline problems by the science teacher?

a b c d 23. .. ..concerning the science teacher using a variety and balance of instructional techniques in the teaching of science?

Student Questionnaire

Instructions:

Below are some questions, answers to which will provide highly useful and necessary information to the researcher. We request you to respond to the questions honestly and accurately. The answers will be kept confidential and analysed only by the researcher.

The questionnaire can be completed in either pen or pencil. You may Begin:

1. Name (optional) ________________________ ___
last First

2. Age ____________

3. School ______________________________

4. Grade in school (Circle) 7 8 9 10 11 12

5. Sex Male__________ Female________

6. Check the number of full years of science that you have taken since entering the 7th grade (count the 7th and this year) __________

7. What final grade did you receive in your last science course?

A______ B________ C__________ D________ F_______

8. Do you like science? Yes______ No_______

9. Do you like this science course? Yes_______ No_______

10. Do you enjoy the assignments (class or home) given by the present science teacher? Yes________ No________

11. Is this year best science course so far? Yes________ No_______

12. If your answer to question 11 is no, it is because: (check most important)

_____ I do not do enough activity in class

_____ He is not the best teacher you have had so far

_____ Teacher is too strict

_____ You can't understand what the teacher says

_____ Any other, specify ____________________

13. What kind of occupation would you like to enter as adult? (State your first choice) ____________________

14. Would you be interested in becoming a scientist, engineer, or a science teacher? Yes_____ No_____

If yes, please check one
scientist_____
Engineer _____
science teacher_____

15. If you have answered yes to question 14, indicate the person who has been most influential in developing your interest in science.

Brother_____
Mother _____
Father _____
Teacher_____
Sister_____
Friend_____
Self_____
Counsellor_____
Relative _____
Other (specify)_____

16. If you are not interested in choosing a career in science or engineering which of the following have something to do with it? Check all statements that explain your feelings.

_____ I am more interested in another career

_____ Science is too difficult for me

_____ Mathematics is too difficult for me

_____ Scientists are peculiar people

_____ You can't make much money as a scientist or engineer

_____ Other reasons (Please state them below)

Facilities Checklist

Instructions:

Please complete the following checklist considering the class that you teach. Any special comments regarding the facilities may be given in the end if not covered in the checklist.

	No	Yes	Outstanding
1. Preparation Room			
2. Teachers Office Space			
3. Multipurpose Room			
4. Plant Growth Area			
5. Storage Space			
6. Teachers Office Space			
7. Sinks			
8. Cold Water Outlets			
9. Hot Water Outlets			
10. Gas Outlets			
11. Compressed Air Outlets			
12. Electrical Outlets			
13. Microscopes			
14. Refrigerator			
15. Glassware			
16. Basic Laboratory Equipment			
17. Basic Laboratory Chemicals			
18. Globes			
19. Specimen			
20. Other teaching aids for demonstration etc.			
21. Funds for perishables, glassware, chemicals and Specimens.			
22. Laboratory Assistants			

	No	Yes	Outstanding
23. **Field Trips**			
a. Permitted to go outside school grounds			
b. Transportation facilities			
c. Funds made available if needed			

*CHECKLIST for ASSESSMENT of SCIENCE TEACHERS:

PUPIL'S PERCEPTIONS

by

William R. Brown
and
Betty J. Brown

Directions: Mark the space on the answer sheet which most closely states your honest opinion of the behavior of your teacher or what usually happens in your classroom. Whether your teacher is a man or a woman, your teacher will be referred to as "he" in all of the questions and the responses. Mark only one response under each of the ten questions. Make all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response does not apply to your teacher. Please mark the one that most closely describes your teacher or what usually is happening in your classroom. Read all the responses before you choose one.

* Experimental Edition: Not to be used or reproduced without the permission of the authors or Dr. Robert W. Howe, 244 Arps Hall, The Ohio State University. November, 1970 edition.

1. How does your teacher keep his class in order?

    a. Our teacher makes us feel free and natural. We are very interested in and busy with school work. We are able to take care of ourselves.

    b. Our teacher sees to it that work goes on with little or no stopping. We usually pay attention to the work at hand.

    c. Our teacher is able to bring the class back to order with a few warning looks or words. The room is fairly quiet. Some students are whispering and not paying attention. The teacher is usually aware of minor misbehaviors.

    d. Our teacher tries but is unable to control the class. We are restless. We do not pay attention. The classroom is noisy.

    e. Our teacher is strict and rules with an iron hand. Most students are tense and nervous. The classroom is very quiet. Students do not respect our teacher.

2. Is your teacher more interested in you or in the subject he is teaching?

    a. Our teacher is interested in us as people. He is aware that we can do, are interested in, and need different things. Our teacher wants to help us with our personal problems as well as with the subject he is teaching. He tries and often does help us with our problems.

    b. Our teacher is aware of our different needs but does little to help us with them. He pays attention to our need to learn the subject he is teaching. He expects less of the lower ability students than of the higher ability students.

    c. Our teacher is aware of our different needs but thinks the teacher should teach only his subject. Our teacher talks about our individual differences but does little about the differences.

    d. Our teacher does not pay attention to any of our individual needs. He is interested only in the subject he is teaching. Sometimes we do "busy work" that has little meaning to us.

    e. Our teacher ignores us as individuals. He thinks only of learning the subject. Every student must learn the same things. We do "busy work," and we usually do work from the textbook.

3. How does your teacher feel about students?

    a. Our teacher looks at us the way we really are. He is friendly and understanding. He likes us and enjoys having us around. He listens to our opinions.

    b. Our teacher understands that we are able to learn and grow up but does little to help us. He seems to want to know us better.

    c. Our teacher often does not try to understand our feelings or opinions. He thinks we "just need to grow up." He usually grades us by what adults can do rather than by what we can do.

    d. Our teacher thinks of us as "little adults," not as teenagers. He tends to expect too much or too little of us.

    e. Our teacher does not try to understand us. He is not interested in the opinions of teenagers. He is often ill at ease or uncomfortable when we are with him.

4. How does your teacher understand students who have behavior problems?

    a. Our teacher is not as worried about students who misbehave in class as he is about students who are "too quiet." He tries to figure out why students do certain things and to help them solve their problems.

    b. Our teacher is aware that students have problems. He looks for reasons why students misbehave. He expects students to behave even if they have problems, and he will punish them if he has to.

    c. Our teacher usually is not aware that students have reasons for doing the things they do. He knows he should learn something about the background of his students, but he often punishes instead.

    d. Our teacher is not aware that students have problems. He treats all students who misbehave the same way. He always punishes them.

    e. Our teacher thinks students who do not obey are the most serious problems. He thinks the shy, quiet students are the "perfect students." He does not try to understand why students act the way they do. He punishes all students who misbehave.

5. What do the students think of your teacher?

   a. Students can talk freely with our teacher. They like our teacher very much.

   b. Students respect and admire our teacher, but they feel uncomfortable when talking to him personally.

   c. Most students like our teacher and are willing to do what he wants.

   d. Students do not fear our teacher, but they do not respect or like him.

   e. Students fear and stay away from our teacher. They might even harm him if they could.

6. What do you do in your science class?

   a. We often talk about the problems scientists have in the discovery of a scientific principle. We also talk about the facts behind a scientist's conclusions. If we do not agree with our teacher, he wants us to say so. We often have time to talk among ourselves about ideas in science. We do most of the experiments and demonstrations ourselves.

   b. We sometimes talk about the problems scientists have in the discovery of a scientific principle. We also talk about the facts that are behind a scientist's conclusions. We sometimes do experiments and demonstrations ourselves. We can question what our teacher says.

   c. We have talked a few times about the problems scientists have in the discovery of a scientific principle. We spend part of our class time answering our teacher's questions. We also write answers to questions from our book or study guides. We do some experiments ourselves.

   d. We ask questions to clear up what the teacher or our book has told us. We watch our teacher do demonstrations. We write answers to questions from our book or study guides. We answer our teacher's questions.

   e. We must copy down and memorize what our teacher tells us. Most of our questions are to clear up what our teacher or our book has told us. We often write answers to questions from our book or study guides.

7. What does your teacher do in class?

   a. Our teacher helps us understand the reason for a lesson before we start it. Our teacher often questions us on ideas we studied earlier. He asks us for the facts behind the ideas in our book. Our teacher often asks us to explain diagrams and graphs.

   b. Our teacher often questions us on ideas we studied earlier. He asks us for the facts behind some of the ideas in our book. He sometimes asks us to explain diagrams and graphs.

   c. Our teacher spends most of the time telling us about science. He repeats much of what our book says. Our teacher sometimes questions us about ideas we studied earlier.

   d. Our teacher sometimes repeats exactly what our book says. If students do not agree, our teacher tells us who is right. Most of the time our teacher tells us about science.

   e. Our teacher shows us that science has most of the answers to questions about the natural world. If students do not agree, our teacher tells us who is right. Our teacher often repeats exactly what our book says.

8. How does your teacher use the textbook and reference materials?

   a. Our teacher expects us to find the major ideas in our book. We must also find the facts to prove the ideas. He shows us how to question ideas in our book. We often read about science in magazines and other books.

   b. Our teacher expects us to learn some of the details in our book. We can use magazines and other books in the room if we want. Our teacher shows us how to question ideas in our book.

   c. Our teacher expects us to learn many of the details in our book. We look for some of the major ideas in our book. We also find the facts to prove the ideas. We sometimes outline parts of our book. The only science we talk about is from our book and our teacher's notes.

   d. Our teacher expects us to outline part of our book. The only science we talk about is from our book and our teacher's notes. We must learn most of the details in our book.

   e. Our teacher does not like us to question information from our book. We often write out definitions to words. We must outline parts of our book. We must memorize most of the details in our book.

9. What are your tests like? How are they used?

   a. Our tests have many questions about our laboratory work. We often figure out answers to new problems. Sometimes we find ways of looking for answers to problems. Often we do things we have learned in our laboratory such as making observations and explaining data.

   b. Our tests have many questions about our laboratory work. We sometimes figure out answers to new problems. Sometimes we do things we have learned in our laboratory such as making observations and explaining data.

   c. Our tests sometimes ask us to label drawings. Our tests sometimes have questions about our laboratory work. Sometimes we must tell about ideas that we learned earlier.

   d. Our tests often ask us to write out definitions to words. We do not use mathematics to answer questions on our tests. Often we must label drawings.

   e. Our tests often ask us to write out definitions to words. Often we must label drawings. We do not use mathematics to answer questions on our tests. We do not have a chance to talk about the test questions in class.

10. What do you do in the laboratory?

   a. We talk about the reasons for an experiment before we do it. We often try our own ways of doing the laboratory work. We compare our answers to those of others when we are finished. We are allowed to do experiments on our own.

   b. We talk about the reasons for most experiments before we do them. The data one student gathers from an experiment are often different from the data gathered by another student. We may do some experimenting on our own.

   c. We sometimes talk about the reasons for experiments. We sometimes compare our answers to those of others when we are finished. We spend less than one third of our time doing laboratory work.

   d. We sometimes know the answer to a question before we do an experiment. We seldom talk about the reason for an experiment. We spend less than one fourth of our time doing laboratory work.

   e. We are not allowed to do experiments on our own. We know the answer to a question before we do an experiment. We do not talk about the reasons for an experiment. We spend very little of our time doing laboratory work.

*CHECKLIST FOR ASSESSMENT OF SCIENCE TEACHERS: SUPERVISOR'S PERCEPTIONS

Directions: Circle the letter of the answer which most accurately indicates your honest and objective evaluation of the behavior of the teacher being rated. Circle only one response under each of the fifteen questions. Mark all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response is not applicable to the subject being rated. The closest approximation is what is desired. Read all the responses before making a decision.

1. What is the status of the teacher's disciplinary ability?

   a. The teacher makes the students feel free and natural. They are actively interested in and busy with school work. They are able to govern themselves.

   b. The teacher sees to it that work proceeds with little or no interruption. The students are usually attentive to the task at hand.

   c. The teacher is able to restore "order" with an occasional reprimand or warning look. The room is fairly quiet; there is some whispering and inattention. The teacher is usually sensitive to minor lapses of conduct.

   d. The teacher attempts but is unable to control his class. Students in his classroom appear restless. There is considerable inattention and noisy behavior.

   e. The teacher is an authoritarian who "rules with an iron hand." An atmosphere of nervousness and tenseness persists. The classroom is exceptionally quiet. The students do not respect the teacher.

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2. Does the teacher have a "student" or a "subject-matter" point of view?

   a. The teacher is interested in the personality development of the student. He is sensitive to individual differences in students' abilities, interests, and needs. The teacher wants to help students with their personal problems as well as with the subject he is teaching. He tries and often does help students with their problems.

   b. The teacher is sensitive to the various needs of students but does little to meet them. He concentrates on the students' need to learn the subject he is teaching. He varies his standards of achievement for students with different levels of ability.

   c. The teacher is aware of the various needs of the students, but he believes the teacher's responsibility is limited to teaching his subject. The teacher talks about the individual differences of students but does little about such differences.

   d. The teacher is insensitive to any of the needs of students. He is interested only in the subject he is teaching. The teacher sometimes requires the students to do meaningless "busy work."

   e. The teacher ignores students as individuals. He thinks only of subject-matter mastery. Every student must meet the same requirements of achievement. The teacher requires meaningless "busy work" of the student. The students usually do work from the textbook.

3. What is the nature of the teacher's attitude toward adolescents?

   a. The teacher regards the adolescent objectively for what he is. The teacher is friendly and understanding. The teacher likes adolescents and enjoys having them around. He listens to the opinions of adolescents.

   b. The teacher understands that adolescents have potentialities for development, but he does little to help them develop these potentialities. The teacher expresses the desire to know adolescents better.

   c. The teacher often does not try to understand the feelings or opinions of adolescents. He thinks adolescents "just need to grow up." The teacher evaluates adolescents by adult standards rather than by what the adolescents can do.

   d. The teacher views the adolescent as a "miniature adult." He tends to expect too much or too little of adolescents.

   e. The teacher does not try to understand adolescents. He is not interested in the opinions of adolescents. He is often ill at ease or uncomfortable when adolescents are with him.

4. How does the teacher understand adolescents who have behavior problems?

   a. The teacher is not as concerned about adolescents who misbehave in class as he is about adolescents who are "too quiet." He tries to find reasons why adolescents act as they do, and he tries to help them solve their problems.

   b. The teacher is aware that adolescents have problems. He looks for reasons why adolescents misbehave. The teacher expects students to behave even if they have problems, and he will punish them if necessary.

   c. The teacher usually is not aware that adolescents have reasons for their actions. He knows he should learn something about the background of adolescents, but he often punishes instead.

   d. The teacher is not aware that adolescents have problems. He treats all adolescents who misbehave the same way. He always punishes them.

   e. The teacher thinks adolescents who are disobedient are the most serious problems. He thinks the shy, quiet adolescents are the "perfect students." He does not try to understand the reasons for the actions of adolescents. He punishes all adolescents who misbehave.

5. What is the attitude of students toward this teacher?

   a. Students can talk freely with the teacher. They like him very much.

   b. Students respect and admire the teacher, but they feel uncomfortable when talking to him personally.

   c. Students generally like the teacher and are willing to do what he wants.

   d. Students do not fear the teacher, but they do not respect or like him.

   e. Students fear and stay away from the teacher. They might even harm him if they could.

6. What do the students do in the teacher's class?

   a. The students often discuss the problems faced by scientists in the discovery of a scientific principle. They also discuss the kind of evidence that is behind a scientist's conclusions. If the students do not agree with the teacher, he encourages them to say so. The students are frequently given time in class to talk among themselves about ideas in science. They usually do most of the experiments and demonstrations themselves.

   b. The students sometimes discuss the problems faced by scientists in the discovery of a scientific principle. They also discuss the evidence that is behind a scientist's conclusions. They sometimes do experiments and demonstrations themselves. They can question what the teacher says.

   c. The students infrequently discuss the problems faced by scientists in the discovery of a scientific principle. They spend part of the class time answering the teacher's questions. They also write answers to questions from their textbook or study guides. They do some experiments themselves.

   d. The students ask questions to clarify what the teacher or the textbook has told them. They watch the teacher do demonstrations. They write answers to questions from the textbook or study guides. They answer the teacher's questions.

   e. The students must copy down and memorize what the teacher tells them. Most of the students' questions are to clear up what the teacher or the textbook has told them. They often write answers to questions from the textbook or study guides.

7. What is the role of the teacher in the classroom?

   a. The teacher helps the students understand the general objectives or purposes of a lesson before they begin work on the lesson. He questions the students about ideas that the students have studied previously and about the evidence that is behind statements that are made in the textbook. He often asks the students to explain diagrams and graphs.

   b. The teacher often questions the students about ideas that they have studied previously and about the evidence that is behind statements that are made in the textbook. He sometimes asks the students to explain diagrams and graphs.

   c. The teacher spends most of the class time telling the students about science. He repeats much of what the textbook says. He sometimes questions the students about ideas that they have studied previously.

   d. The teacher sometimes repeats exactly what the textbook says. If there is a disagreement among students during a discussion, the teacher usually tells the students who is right. Most of the time the teacher tells the students about science.

   e. The teacher shows the students that science has almost all of the answers to questions about the natural world. If there is a disagreement among students during a discussion, the teacher tells the students who is right. The teacher often repeats exactly what the textbook says.

8. How does the teacher use the textbook and reference materials?

   a. The teacher expects the students to find the major ideas in the textbook and the evidence to support the ideas. He shows the students how to question ideas in the textbook. The teacher provides time for the students to read about science in magazines and books other than the textbook.

   b. The teacher expects the students to learn some of the details in the textbook. There are books and magazines in the room if the students want to use them. The teacher shows the students how to question ideas in the textbook.

   c. The teacher expects the students to learn many of the details in the textbook. The teacher has the students look for some of the major ideas in the textbook and the evidence to support the ideas. He sometimes requires students to outline parts of the textbook. The only science talked about is from the textbook and the teacher's notes.

   d. The teacher expects the students to outline part of the textbook. The only science talked about is from the textbook and the teacher's notes. The teacher requires the students to learn most of the details in the textbook.

   e. The teacher does not like the students to question information in the textbook. The teacher often has the students write out definitions to words. The teacher requires the students to outline parts of the textbook and to memorize most of the details in the textbook.

9. How are the teacher's tests designed, and how are they used?

   a. The teacher's tests have many questions about the laboratory activities. The tests often require the students to figure out answers to new problems. Sometimes the students must find ways of looking for answers to problems. Often they must repeat skills they have learned in the laboratory, such as making observations and interpreting data.

   b. The teacher's tests have many questions about the laboratory activities. The tests sometimes require the students to figure out answers to new problems. Sometimes the students must repeat skills they have learned in the laboratory, such as making observations and interpreting data.

   c. The teacher's tests sometimes ask the students to label drawings. The tests sometimes have questions about the laboratory activities. Sometimes the tests require the students to tell about ideas that they have learned previously.

   d. The teacher's tests often ask the students to write out definitions to words. The tests do not require the use of mathematics to answer the questions. Often the tests require the students to label drawings.

   e. The teacher's tests often require the students to write out definitions to words. Often the students must label drawings. The tests do not require the use of mathematics to answer the questions. The teacher does not provide the opportunity to discuss the test questions in class.

10. How does the teacher conduct the laboratory?

   a. The teacher and students spend time before an experiment discussing the purposes of the experiment. The teacher often allows the students to try their own ways of doing the laboratory experiment. The students can compare their answers to those of others when they are finished. They are allowed to do experiments on their own.

   b. The teacher and students spend time before most experiments discussing the purposes of the experiment. The data one student gathers from an experiment are often different from the data gathered by another student. The teacher allows the students to do some experimenting on their own.

   c. The teacher and students sometimes discuss the purposes of an experiment. The students sometimes may compare their answers to those of others when they are finished. The teacher allows less than one third of class time for laboratory experiments.

   d. The teacher sometimes conducts the laboratory in such a way that the students know the answers to a question before they do an experiment. The teacher and students seldom discuss the purposes of an experiment. The teacher allows less than one fourth of the class time for laboratory experiments.

   e. The teacher does not allow students to do experiments on their own. The teacher conducts the laboratory in such a way that the students know the answers to a question before they do the experiment. The teacher does not discuss the purpose of an experiment. The teacher allows very little class time for laboratory experiments.

11. Is the teacher capable of analytical thinking?

   a. The teacher is intellectually mature. He approaches problems analytically, is capable of theorizing, and enjoys solving problems. His work is carefully planned and detailed. He is persistent and serious.

   b. The teacher is generally persistent, serious, and able to analyze and solve more pressing problems. He attempts to organize and plan his work, but he is sometimes lacking in details.

   c. The teacher is capable of analytical thinking, but at times he accepts the ideas of others uncritically rather than doing independent thinking. He avoids activities that involve careful planning and detailed work unless he is asked to become involved. He uses habitual procedures.

   d. The teacher appears to be casual rather than serious. He is likely to attend to duties as the "spirit moves him." He is willing to "go along with the crowd."

   e. The teacher accepts uncritically the ideas of others. He may not be able to think critically. He is willing to avoid planning and thinking. He dislikes intellectual or creative activities.

12. What are the social attitudes of the teacher?

   a. The teacher is more interested in people than in things. He converses readily and freely, and makes friends easily. He participates in and enjoys social mixing. He frequently assumes leadership positions.

   b. The teacher usually appreciates the opportunity to work with people and seems to enjoy social activities. He appears to be at ease in social groups. He attempts to analyze and improve social relationships.

   c. The teacher is quite friendly, but reserved. He will participate in social events only to the extent demanded by his position. He will assume leadership only when asked to do so.

   d. The teacher does not like to assume leadership in social functions. He tends to be more interested in things than in people. He dislikes affiliating with social groups.

   e. The teacher is very self-conscious, shy, and socially timid. He gives evidence of lacking common social skills. He prefers to be alone.

13. What emotional attitudes are shown by the teacher?

   a. The teacher's "spirits" are stable and uniform. He is not subject to apprehensive fears or worries and is not easily upset or frustrated. He avoids tension through relaxation. He sees life in reality. He is optimistic.

   b. The teacher usually demonstrates good emotional control. He takes things in stride; he settles most minor problems without undue tension or frustration. He appears to be well adjusted and has good physical vigor.

   c. The teacher is moody and sometimes emotionally unstable. He frequently appears rushed or disrupted by minor problems. He attempts to be calm in most situations. His poise comes only with considerable effort.

   d. The teacher is usually serious and reserved. He is indecisive and uncertain. He often appears distracted as though torn by several demands. He frequently seems embarrassed.

   e. The teacher is easily disrupted by minor problems and events. He is readily and easily embarrassed. He often appears tired and listless. His actions appear impulsive and jittery. He frequently feels thwarted and suffers from tension, worry, and uneasiness. He is frustrated and impatient.

14. To what extent does the teacher demonstrate self-confidence?

a. The teacher makes decisions readily. He feels confident of his own judgment and usually makes correct decisions. He easily adjusts to new or difficult situations. He enjoys the approval and favor of his associates. He is optimistic about the present and the future. He is not dissatisfied with his physique or appearance.

b. The teacher is usually equal to varying demands. He does not hesitate to make decisions even though they are not always approved by others. He generally adjusts to new situations without tension.

c. The teacher sometimes feels inferior. He is often pessimistic about the past and the future. He makes decisions but often does not have confidence in his judgments.

d. The teacher avoids new or difficult situations, preferring to follow his habitual routines. He feels sorry for himself much of the time. He makes decisions only after consulting with several friends and associates. He is generally dissatisfied with his personal appearance and ability.

e. The teacher displays the traditional "inferiority feeling." He cannot make decisions satisfactorily or easily. He distrusts his own judgment and ability.

15. To what extent does the teacher develop satisfactory personal relations?

a. The teacher does not lose patience readily and is not angered frequently or easily. He does not feel slighted or misunderstood by others. He is seldom excessively critical of friends and associates.

b. The teacher is conversational and friendly. He has a good sense of humor. He usually has an understanding point of view. He has reasonably good control of his temper.

c. The teacher attempts to work satisfactorily with others when the occasion demands. He is inclined to lose patience when the "chips are down." He tends to be overly critical of friends and associates.

d. The teacher tends to lose patience easily and frequently when working with associates. He displays little effort to work effectively with others.

e. The teacher is easily irritated by others. He is usually touchy and suspicious. He is inconsiderate when working with his associates. He frequently antagonizes others.

*SCIENCE CLASSROOM ACTIVITY CHECKLIST: TEACHER'S PERCEPTIONS

The purpose of this checklist is to determine the types of activities which you feel should take place in your science classroom. The classroom, for purposes of this instrument, is defined to include the laboratory. Each statement describes some classroom activity(ies). The activities are not judged as either good or bad; therefore, this checklist is not a test and is not designed to evaluate you. You are to read each statement and decide if the statement is true or false based on what you feel should take place in your science classroom.

SAMPLE QUESTION

Checklist	Answer Sheet
	T F
1. All students should always wear laboratory aprons in the laboratory.	1. ( ) ( )

If the statement describes what should occur in your science classroom, blacken the space under the letter T (True) on the answer sheet; if it does not, blacken in the space under the letter F (False).

All of the statements must be responded to, so if a statement is not completely true or false you will have to decide whether it is more true than false or vice-versa and make the mark accordingly.

All answers should be recorded on the answer sheet provided. NO MARKS should be made in the test booklet.

There is no time limit for completing this checklist.

Begin

*Experimental Edition: Not to be reproduced or used without the permission of Richard L. Sagness, 244 Arps, The Ohio State University.
Revised Edition, August, 1969.

1. The student's role is to copy down and memorize what the teacher tells him.
2. Students should frequently be allowed time in class to talk among themselves about ideas in science.
3. Over 25% of the class time should be devoted to students answering orally or in writing answers to questions that are in the textbook or in study guides.
4. Classroom laboratory activities, such as experiments and demonstrations, should usually be performed by students rather than by the teacher.
5. Science classes should provide for some discussion of the problems facing scientists in the discovery of a scientific principle.
6. If a student disagrees with what the teacher says, he should say so.
7. Most questions students ask in class should be to clarify statements made by the teacher or the text.
8. It is important that students discuss the evidence behind a scientist's conclusion.
9. A majority of class time should be spent lecturing about science.
10. A teacher should be very hesitant to admit his mistakes.
11. A teacher should generally provide the answer when students disagree during a discussion.
12. It is desirable for teachers to frequently repeat to their students almost exactly what is in the textbook.
13. A teacher should frequently cause students to explain the meanings of statements, diagrams, graphs, etc.
14. Science should be presented as having almost all of the answers to questions about the natural world.
15. Teacher questions should require students to think about ideas they have previously studied.
16. Teacher questions should force students to think about the evidence that is behind the statements that are made in the textbook.
17. The general objectives of a lesson should be understood by the students before work on the lesson is begun.
18. Students should learn most of the details stated in the text.
19. It is important that students frequently write out definitions to word lists.
20. When reading the textbook, students should be expected to look for the main problems (ideas) and for the evidence that supports them.

21. Students should be taught how to ask themselves questions about statements in the text.

22. The textbook and the teacher's notes should provide about the only sources of scientific knowledge for class discussion.

23. Students should often read in sources of science information (books, magazines, etc.) other than their textbook.

24. The student should often be required to keep outline notes on sections of the textbook.

25. The textbook is based on scientific fact and as such should not be questioned by students.

26. Tests should include many items based on what students have learned in their laboratory investigations.

27. Tests should often require writing out the definitions of terms.

28. Tests should often ask students to relate ideas that they have learned at different times.

29. Tests should often require the figuring out of answers to new problems.

30. Tests should often provide data the students have not seen previously and ask the students to draw conclusions from these data.

31. Tests should often require students to put labels on drawings.

32. Student evaluation should include formal means of evaluating the performance of skills learned in laboratory activities; e.g. observation, interpretation of data, etc.

33. Tests should seldom contain problems which involve the use of mathematics in their solution.

34. Students should occasionally be given problems for which they must design ways of looking for solutions.

35. Students should occasionally be given research reports and asked to evaluate the procedures used in looking for solutions to the problem.

36. It is a waste of time after a test to have students discuss questions they have on the test.

37. Students should be told step-by-step what they are to do in the laboratory.

38. Students should spend time before most laboratory investigations in discussing the purpose of the experiment.

39. Equipment and solutions should not be gathered and/or prepared in advance of laboratory sessions.

40. Science laboratories should meet on a regularly scheduled basis (such as every Tuesday and Friday).

41. The laboratory should often be used to investigate a problem that comes up in class.

42. A laboratory should usually precede the discussion of the specific topic in class.

43. Laboratory activities should usually be related to the topic that is being studied in class.

44. Students should usually know the answer to a laboratory problem that they are investigating before they begin the experiment.

45. Most laboratory activities should be done by the teacher or other students while the class watches.

46. It should be expected that the data collected by various members of a class will often be different for the same experiment.

47. During an experiment the students should record their data at the time they make their observations.

48. Students should sometimes be asked to design their own experiments to seek answers to a question that puzzles them.

49. Students should often ask the teacher if they are getting correct results in their experiments.

50. The teacher should answer most of the students' questions about laboratory work by asking the students questions.

51. One fourth or less of class time should be spent doing laboratory work.

52. Students should always be required to follow teacher or laboratory manual specified ways of doing laboratory work.

53. Laboratories should be directed at students thoroughly learning the names of specific structures and specific sequences of events.

54. Laboratory observations should be discussed within a day or two after the completion of the activity.

55. After completion of a laboratory activity individual students or student groups should have an opportunity to compare data.

56. Students should be required to copy the purposes, materials, and procedures used in their experiments from the text or laboratory manual.

57. Students should be allowed to go beyond the regular laboratory exercise and do some experimenting of their own.

58. Students should have an opportunity to analyze the conclusions that they have drawn in the laboratory.

59. A class should be able to explain all unexpected data collected in the laboratory.

60. Students should spend time in the interpretation of graphs and tables of the data which they collect.

APPENDIX D

LETTERS WRITTEN TO SCHOOLS AND TEACHERS

THE OHIO STATE UNIVERSITY

March 6, 1975

Dear Principal:

The success of an instructional program depends on the quality of teachers. Need for good teachers who can function successfully in schools has been felt by almost all administrators, teacher educators and students. The Faculty of Science and Mathematics Education at The Ohio State University has been involved for the past five years in an extensive field-based teacher education program for preparing science teachers. Efforts are made continuously to get feedback from the administrators, teachers, and students regarding the quality of performance of the program graduates in schools. Such assistance has been very useful in the past for improving the program.

We are seeking your cooperation in this effort to evaluate the pre-service teacher education program for science teachers. A study has been planned to gather data on almost all graduates currently teaching in Ohio who were enrolled in the Faculty of Science and Mathematics Education pre-service teacher education program during the past five years. A detailed plan for the study is enclosed for your information.

It will be highly appreciated if you will complete the enclosed questionnaire and send it to us. Our main concerns at this point are:

(i) whether the teacher(s) whose names are on the questionnaire are employed and currently teaching science in your building;

(ii) whether you are willing to approve this study being conducted in your school;

(iii) any other questions?

Please feel free to call or write if you desire clarification on any aspects of this study. We hope you will cooperate with us in this project. Thanks. Please return the enclosed post card with your response.

Robert W Howe	Stanley L. Helgeson	Piyush Swami
Robert W. Howe	Stanley L. Helgeson	Piyush Swami
Chairman	Associate Professor	Graduate Research Associate

RWH/SLH/PS/kss

Enclosure

College of Education   Faculty of Science and Mathematics Education   1945 North High Street   Columbus, Ohio 43210   Phone (614) 422-4121

SELF-ADDRESSED POSTCARD TO BE RETURNED

Please answer the following questions and return the post card to us. Thank you.

1. Are the following teacher/s employed in your school building? Yes / No

2. Do you have any other science teachers working with you who graduated from OSU during 1970-74? Yes / No
   If yes, please indicate name/s ____________________
   ____
3. OSU can / can not conduct the study in the school.
4. Preferred time for data collection (Please circle one).
   April '75 May '75

5. Comments or questions:

STUDY DESCRIPTION

Following is a description of the field study to provide information for teachers and administrators concerning teacher, student, and supervisor participation, school visitations by the investigator, and material costs.

I. Teacher Participation

The former graduate(s) from the Faculty of Science and Mathematics Education at The Ohio State University during the period 1970 through 1974 and presently teaching in Ohio will be identified for participation in the study. Each of them will be asked to complete two checklists and a questionnaire. In addition each will be asked to administer a checklist and a questionnaire to students in a single class of his/her choice.

II. Student Participation

Students in a single science classroom will complete a checklist and a questionnaire (covering biographical information). The students will not be identified on the instruments.

III. Supervisor Participation

The supervisor or principal for the science teacher participating in the study will be requested to complete a checklist and a questionnaire. An interview (10-15 minutes) with the supervisor or principal will also be requested.

IV. Instruments

Approximate times for completing each instrument are given in parentheses.

Teacher Data

1. Science Classroom Activity Checklist: Teacher's Perception (10 minutes)
2. Facilities Checklist (10 minutes)
3. Teacher Questionnaire (10 minutes)

Student Data

4. Checklist for Assessment of Science Teachers: Pupil's Perception (shorter version) (20 minutes)

5. Student Questionnaire (10 minutes)

Supervisor Data

6. Checklist for Assessment of Science Teachers: Supervisor's Perceptions (20 minutes)

7. Supervisor's Questionnaire (10 minutes)

Interviews

8. with the teacher (15 minutes)

9. with the supervisor (15 minutes)

V. School Visitations

During the study the investigator has planned to confer with the teachers participating in the study. Such visitations will be a minimum of 1-2 visits per school. Schools will be contacted in advance to determine dates and times for such visits. The classroom observations will be informal and to be made only with the consent of the teacher concerned.

VI. All materials will be supplied by The Ohio State University. Mailing expenses incurred through the return of materials will also be paid by The Ohio State University.

The above information provides essential data which will be of interest to both administrators and teachers. The names and other identification of teachers, students, supervisors, and schools will be kept confidential. All information obtained will be treated in a professional manner.

THE OHIO STATE UNIVERSITY

Dear

The Faculty of Science and Mathematics Education at The Ohio State University is currently in the process of conducting a follow-up study for evaluation of the preservice teacher education program. We are attempting to receive feedback from our graduates during the past five years as well as the administrators and students. Such feedback may be valuable in exploring new directions for the improvement of the preservice teacher education program.

We have already contacted the principal in your school. Formal approval for conducting the study has been given by the school administration.

In order to proceed with the study, it is essential that we seek your cooperation. We are enclosing a brief description of important aspects of the study.

Please note that we are not evaluating individual teachers. The information collected will be used only for research purposes at The Ohio State University. The data will not be released to school administrators except in a combined form in the final report. No names will be identified in any report.

We certainly hope that you will cooperate with us in this project. Please use the enclosed form to indicate your willingness to participate in the study. A stamped addressed envelope is enclosed.

Your early response will be greatly appreciated. Should there be a need for clarification on any aspect of the study, please phone or write us.

We hope you are having a good year and enjoying your work.

Sincerely,

Robert W. Howe Stanley L. Helgeson Piyush Swami

Robert W. Howe
Chairman

Stanley L. Helgeson
Associate Professor

Piyush Swami
Graduate Research
Associate

RWH/SLH/PS/kss
Enclosure

College of Education · Faculty of Science and Mathematics Education · 1945 North High Street · Columbus, Ohio 43210 · Phone (614) 422-4121

Name ______________________________

School ______________________________

School Address ____

A. I will participate in the study ___Yes ___No

B. If you have marked yes above, please select one of your science classes that is taught most like you believe science ought to be taught in schools.

Please provide the following information about the class you selected:

Title of course (class) ______________________________

Number of students in class ____________

Length of class periods/modules ____________

Indicate when this class meets

Time

	7	8	9	10	11	12	1	2	3	4	5
M											
T											
W											
R											
F											

How many years have you taught this class? ______
(Include this year as one)

C. Do you have a department head or supervisor in the building in addition to the principal? ___Yes ___No

Name of head or supervisor ______________________________

D. Please give your address and phone number where you can be reached by the investigator after school hours, if need be

____

____

THE OHIO STATE UNIVERSITY

April 2, 1975

Dear Sir:

Thank you for allowing us to conduct the follow-up study in your school. A separate letter including the detailed description of the study has been sent to

The itinerary for school visits has been finalized. I plan to visit your school on in the morning / afternoon. I shall be travelling through your area during this time, and any suggested changes might alter plans for many other schools in the area.

The agenda for this visit includes a conference with the principal or science supervisor in the building (approximately 20 minutes); a conference with the above mentioned science teacher/s (15-20 minutes); a visit to science laboratories (20 minutes); and an optional classroom visit (10-15 minutes).

Any instruments connected with the study would not be administered during the visit to the school. The dates suggested for such administrations are April 21 - May 16, 1975. The materials and instructions for this will be mailed.

I hope the above date for the school visit will not disturb the school program in any way. Please send us your reply on the bottom portion of this letter in the enclosed self-addressed and stamped envelope. Thanks.

Sincerely,

Piyush Swami

Piyush Swami
Graduate Research Associate

Name of the school ______________________________

The date and time of the school visit is suitable ____ Yes ____ No

If no, the suggested new date and time is ____________________

Signature ____________________

Please cut this bottom portion and send it in the enclosed envelope. Thanks.

THE OHIO STATE UNIVERSITY

April 26 1975

Re.: Follow-up Study undertaken by the Faculty of Science and Mathematics Education concerning the science teacher(s) from your school.

Dear Sir:

In an attempt to receive useful feedback regarding the quality of the pre-service secondary science teacher education program at this university, I am requesting your cooperation in completing the enclosed questionnaires. We believe that your comments regarding science teaching and the performance of our past graduate(s) teaching science in your school will provide a realistic picture and should be given major consideration in this study.

Enclosed are the two questionnaires--- Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP), and Administrator's Questionnaire (AQ). A computer scoring response sheet is also enclosed.

The responses for CAST:SP should be given on the computer scoring sheet by marking the appropriate option with a black pencil for items 1-15. Please write your name against INSTRUCTOR in the right hand corner. The responses for AQ may be given on the questionnaire itself. Both the questionnaires must be completed by the same individual. Please do not fold the computer sheet.

All the information collected from these questionnaires will be kept confidential. No names and other identifications for schools and individuals responding to questionnaires will be released in the final report.

The self-addressed and stamped envelope is enclosed for your convenience. An early response will be greatly appreciated.

Thanks for your cooperation in this study.

Sincerely
Piyush Swami
Piyush Swami
Graduate Research Associate

enclosures

College of Education Faculty of Science and Mathematics Education 1945 North High Street Columbus, Ohio 43210 Phone (614) 422-4121

APPENDIX E

DESCRIPTION OF THE PRESERVICE PROGRAM FOR SECONDARY SCIENCE TEACHERS AT THE OHIO STATE UNIVERSITY

FORMAT FOR UNDERGRADUATE PROGRAM IN SCIENCE EDUCATION

The project consists of five quarters (J_1, J_2, J_3, S_1, and S_2) which incorporate course work and experiences meeting all state certification requirements. Please do not enroll for any "required" education or psychology courses (except Psychology 100) until you have consulted with an adviser in Science Education.

	AUTUMN QUARTER	WINTER QUARTER	SPRING QUARTER
JUNIOR YEAR	J_1 (5-8 hours credit) JUNIOR HIGH SCHOOL 1) Tutor one 9th grade student two days/week, one period/day 2) Observe a) this student in class (preferably science class), b) other teacher, c) general functioning of the school 3) Attend seminars twice a week after school 4) Work on laboratory modules in 274 Arps Hall Time needed for project: 1) two half days (M/W T/Th) for school experiences 2) two two-hour blocks for on-campus laboratory work	J_2 (5-8 hours credit) ELEMENTARY SCHOOL 1) Teach science two periods/week (one period/day) in grades K-6 (grade assignment stays the same all quarter) 2) Assist cooperating teacher in other activities in class 3) Observe at other grade levels 4) Attend seminar once a week after school 5) Perform additional laboratory activities in 274 Arps Hall Time needed for project: 1) two half days (M/W T/Th) for school experiences 2) two two-hour blocks for on-campus laboratory activities	J_3 (4 hours credit) SENIOR HIGH SCHOOL 1) Teach laboratory activities two periods/week in your content area 2) Observe a) other science teachers in your content area, b) teachers of other sciences 3) Assist cooperating teacher in other duties 4) Attend seminar once a week after school 5) Do laboratory activities in 274 Arps Hall Time needed for project: 1) two consecutive half days a week (M/T T/W W/Th) for school experiences 2) two two-hour blocks for on-campus laboratory activities
SENIOR YEAR	S_1 (17-18 hours credit) JUNIOR or SENIOR HIGH SCHOOL 1) Participate in orientation program 2) Teach half days in an inner-city type school for half the quarter; outer type for the other half 3) Conduct lab activities in practicum course on campus 4) Participate in philosophy of education seminars 5) Conduct additonal activities related to individual and small group studies	S_2 (15-18 hours credit) JUNIOR or SENIOR HIGH SCHOOL Full-time student teaching in either an inner-city type or more suburban-type school (type of school determined by the student in consultation with adviser in program) Time needed for project: the school day Time needed for project: the school day	CONTENT QUARTER S_1-S_2 sequence may be completed Autumn and Winter Quarters, Winter and Spring Quarters, or (if need be) Autumn and Spring Quarters

FORMAT FOR POST-DEGREE PROGRAM IN SCIENCE EDUCATION

The only entry point into the three-quarter professional sequence for Post-Degree students is Autumn Quarter. Prior to entry, the student must be admitted to the College of Education, have completed all content courses for the comprehensive major, and successfully completed either Psychology 100 or Psychology 300. Three quarters of full-time residence in the College of Education with a minimum of 45 quarters hours of credit is necessary to receive the Bachelor of Science in Education degree. Completion of this makes the candidate eligible for the Ohio Four-Year Provisional High School Teacher's Certificate.

AUTUMN QUARTER	WINTER QUARTER	SPRING QUARTER
PD_1 (4 hours credit) ELEMENTARY SCHOOL	S_1 (17-18 hours credit) JUNIOR or SENIOR HIGH SCHOOL	S_2 (15-18 hours credit) JUNIOR or SENIOR HIGH SCHOOL
1) Teach science two periods a week (one period/day) in grades K-6 (grade assignment stays the same all quarter) 2) Assist cooperating teacher in other activities in class 3) Observe at other grade levels 4) Attend seminar once a week after school 5) Perform additional laboratory activities in 274 Arps Hall	1) Participate in orientation program 2) Teach half days in an inner-city type school for half the quarter; outer type for other half 3) Conduct lab activities in practicum course on campus 4) Participate in philosophy of education seminars 5) Conduct additional activities related to individual and small group studies	Full-time student teaching in either an inner-city or more suburban-type school (type of school determined by student in consultation with adviser in program)
* * *	* * *	* * *
Time needed for project: 1) two half days (M/W, T/Th) for school experiences 2) two two-hour blocks for on-campus laboratory experiences	Time needed for project: the school day	Time needed for project: the school day

THE OHIO STATE UNIVERSITY
COLLEGE OF EDUCATION
1945 NORTH HIGH STREET
COLUMBUS, OHIO 43210

FACULTY OF SCIENCE AND
MATHEMATICS EDUCATION

(614) 422-4121

TO: Cooperating Public School Personnel and Ohio State University Undergraduate Students in Science-Mathematics Education

FROM: Faculty of Science-Mathematics Education

DATE: Summer, 1972

SUBJECT: General Description of First Quarter of Junior Year (J_1) Program

Course: Education 435, five credit hours.
Education 594.27, three credit hours. (Science only)

Focus: Individual junior high school students.

Objectives: The J_1 student will:

1. Be able to identify the interests, needs, and background of an individual student.
2. Identify some learning styles of junior high school students.
3. Be able to identify and locate resources which can be used in attempting to help students learn.
4. Become able to communicate effectively with a student in a one-to-one relationship.
5. Develop and use a variety of tutorial teaching strategies.
6. Gain poise and confidence in his ability to function as a tutor.
7. Develop means of evaluating his own progress as a tutor as well as his student's progress in learning mathematics or science.
8. Become an intelligent observer of classroom interaction and the resultant influence on individual student interest and achievement.
9. Gain insight into the many and varying roles of a teacher.

10. Become acquainted with the philosophy and objectives of a particular junior high school and the school's instructional procedures, administration, counseling, and mathematics or science department personnel.
11. Become aware of personal strengths and weaknesses as a potential teacher, particularly in a junior high school setting.

Program:

Each college junior works as a tutor in a junior high school with a pupil who has been identified by a classroom teacher as one who needs help in mathematics or science. The J_1 student tutors his pupil twice a week, one period each time. Video tapes will be made of some tutoring sessions with the expectation that they will be analyzed in follow-up seminar sessions. The J_1 student spends additional time in the school observing mathematics or science and other classes, and in becoming acquainted generally with the school's program and staff; a college instructor will be present to serve as a resource person in these efforts.

Two seminars are held each week. At least one of the seminars is held at the junior high school with classroom teachers, faculty, mathematics or science education, and curriculum faculty. Seminar discussions center around problems encountered by the J_1 students in their tutoring situations or in other situations they have observed in the school. These problems might include methods of identifying learning problems, alternative means of motivation, instructional strategies, teaching styles, methods for stimulating interest in mathematics or science, and the development of methods to evaluate the success of tutoring sessions.

Activities:

To accomplish the objectives listed above the J_1 student should engage in school based activities such as the following:

1. Meet twice weekly with the pupil he is tutoring.
2. Study his pupil by observing him in other school situations and by gathering information from other sources such as teachers, counselors, nurse, and cumulative records.
3. Observe more than once at least four teachers in the school. At least two of these teachers should be in fields other than science or mathematics; attempt to determine in each case (a) the teacher's approach to content (b) the teacher's pattern of interaction with his pupils and (c) the teacher's techniques of classroom management.
4. Discuss in an exploratory fashion with some teachers their ideas about teaching.
5. Study the pattern of testing, grading, and evaluating pupil progress used in the school.
6. Analyze the teaching strategies he uses and assess the quality of communication and rapport he is able to establish with his pupil by studying in seminar settings, audio and/or video-tapes of his work.
7. (Science Only) Complete, on campus, a series of individualized laboratory activities which emphasize the process nature of science and the development of behavioral objectives for science instruction.

Typical Readings:

AAAS	Science, A Process Approach: Commentary for Teachers
Ausubel	Facilitating Meaningful Verbal Learning In The Classroom
Ausubel	The Use of Advance Organizers in The Learning and Retention of Meaningful Verbal Material
Brownell	Meaning and Skill-Maintaining the Balance

J_1 Continued

Brownell	The Progressive Nature of Learning in Mathematics
Davis	Discovery in The Teaching of Mathematics
Davis	The Madison Project's Approach to A Theory of Instruction
Davis and Greenstein	Jennifer
Gagné	The Conditions of Learning
Hall	The Silent Language
Holt	How Children Learn
Holt	How Children Fail
Mager	Preparing Instructional Objectives

THE OHIO STATE UNIVERSITY
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1945 NORTH HIGH STREET
COLUMBUS, OHIO 43210

Faculty of Science and
Mathematics Education

(614) 422-4121

TO: Cooperating Public School Personnel and Ohio State University Undergraduate Students in Science-Mathematics Education

FROM: Faculty of Science-Mathematics Education

DATE: Summer 1972

SUBJECT: General Description of Second Quarter of Junior Year (J_2) Program

Course: Psychology 230, five credit hours. (Joint staffing with psychology department personnel)
Education 594.27, three credit hours. (Science only)

Foci: Individual (elementary school) pupils as members of small groups.
Child growth and development.
Learning theories.

Objectives: The J_2 student will:

1. Become able to identify individual pupil and teacher differences which influence the learning patterns of elementary school pupils.
2. Develop and use instructional strategies which honor individual differences in small group settings.
3. Become familiar with group dynamics research and start to use this information to improve teaching - learning in small and large groups.
4. Become aware of the elements involved in the concept of "motivation" and the importance of motivation as a factor in pupil success in school.
5. Acquire knowledge of child growth and development and apply this in learning activities for use with his pupils.
6. Acquire knowledge of what is involved in concept formation and problem solving and apply this in learning activities.
7. Acquire understanding of what is involved in creativity and divergent thinking and use this in learning activities.

8. Identify curriculum problems and national curriculum projects designed to improve elementary school mathematics or science.

9. Become acquainted with the objectives and philosophy of the school's elementary mathematics or science program and its relation to the corresponding secondary school program.

10. Become familiar with the philosophy and functioning of a particular elementary school, its staff, and the population it serves.

11. Learn to function as a member of a teaching team as he works with other adults and a class of elementary school pupils.

12. Become increasingly aware of his personal strengths and weaknesses as a potential teacher, particularly with elementary and junior high school pupils.

Program:

As many as four J_2 students may be assigned to a single cooperating teacher in an elementary school but each student is primarily responsible for only one small group of pupils. It may be appropriate, at times, for a J_2 student or team to conduct a lesson in science or mathematics for an entire class. J_2 students spend four-six hours per week in the school with about half of that time devoted to instruction of their small group and working with their cooperating teacher. The remaining time is used in observing class activities in the building, and in conferring with their cooperating teacher or other school personnel.

Two seminars are held each week. At least one of these will be held at the elementary school so that interested and available cooperating teachers as well as J_2 students and university personnel can provide discussion input. Seminar topics again center around problems encountered by J_2 students and might include establishing favorable learning climates, teaching techniques useful for small groups, principles of group dynamics, methods of analyzing student interaction, ways of utilizing individual differences in teaching science and mathematics and other matters related to understanding and using a sound psychology of learning.

J_2 science education students are also involved in additional activities on campus. They continue work with the individualized laboratory modules which emphasize the process and product concepts inherent in the nature of science. They are also expected to develop instructional packages which illustrate the nature of science and which can be used in their teaching. Techniques of evaluation and methods for effective planning are also emphasized.

Activities:

To accomplish the objectives listed above the J_2 student should engage in school based activities such as the following:

1. Work twice weekly with the small group of elementary children to whom he is teaching mathematics or science.
2. Study very carefully at least two pupils in his instructional group in terms of their learning styles, motivation, and other psychological sociological factors.
3. Observe more than once at least three teachers in the school (preferably at different grade levels) attempting to determine in each case (a) the teacher's approach to content (b) the teacher's pattern of interaction with his pupils, and (c) the teacher's techniques of classroom management.
4. Discuss in an exploratory fashion with some teachers their ideas about classroom management, teaching the non-reader, creativity in young children, and so forth.
5. Use a variety of methods and techniques in presenting mathematics or science content. Give special attention to inquiry teaching and using questions to promote higher level thinking.

6. Devise and use methods of evaluating student progress without resorting to paper and pencil tests.

7. Study the feasibility of integrating mathematics and/or science with other subject matter areas, i.e., how much English, mathematics, and social studies can be taught easily in science lessons and vice versa.

8. Observe the general socio-economic nature of the families living in the school attendance area.

9. Analyze the similarities and differences in the "teaching styles" of elementary and junior high school teachers.

10. Study the pattern of testing, grading, evaluating, and reporting of pupil progress used in the school.

11. (Science only) Complete, on campus, a series of individualized laboratory activities which emphasize the process nature of science and the development of behavioral objectives for science instruction.

Typical Readings

Adler	Mental Growth and The Art of Teaching
Ausubel	Some Psychological and Educational Limitations of Learning by Discovery
Berlyne	Recent Developments in Piaget's Work
Bruner	On Learning Mathematics
Combs	Individual Behavior
Copeland	How Children Learn Mathematics
Cronbach	Issues Current in Educational Psychology
Dienes	A Theory of Mathematics-Learning
Elking	Giant in the Nursery: Jean-Piaget
Gagne	Learning and Proficiency in Mathematics
Gagne	Some New Views of Learning and Instruction
Gagne	Varieties of Learning

Glasser	Schools Without Failure
Hartman	Gestalt Psychology and Mathematical Insight
Hendrix	Learning By Discovery
Jackson	Life in The Classroom
Kohl	The Open Classroom
Kuslan and Stone	Teaching Children Science: An Inquiry Approach
NSTA	Theory Into Action
Suchman	Inquiry and Education
Watson	What Psychology Can we Trust?

Additional books assigned by psychology department personnel.

THE OHIO STATE UNIVERSITY
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1945 NORTH HIGH STREET
COLUMBUS, OHIO 43210

Faculty of Science and
Mathematics Education

(614) 422-4121

TO: Cooperating Public School Personnel and Ohio State University Undergraduate Students in Science Education

FROM: Faculty in Science Education

DATE: Summer 1972

SUBJECT: General Description of Third Quarter of Junior Year (J_3) Program

Course: Education 551, four credit hours

Focus: Individual senior high school students in laboratory and classroom settings.

Objectives: The J_3 student will be able to:

1. Apply knowledge of teaching-learning theory and adolescent psychology to solve problems encountered in the classroom.
2. Demonstrate effective inquiry strategies for laboratory activities in high school science classes.
3. Use behavioral objectives, involving the three domains, in preparing lesson plans for classroom or laboratory instruction.
4. Use effectively audio-visual materials appropriate for teaching specific topics or concepts.
5. Demonstrate a knowledge of appropriate evaluation techniques for assessing outcomes of instruction; including student self-evaluation.
6. Identify different patterns of pupil and pupil-teacher interaction as they occur in small and large groups.
7. Identify characteristics of a favorable learning environment.
8. Exhibit poise and confidence when placed in charge of various teaching situations.

9. Become familiar with the philosophy and objectives of a particular senior high school.
10. Use self-evaluation techniques regarding his personal strengths and weaknesses as a potential teacher.

Program:

J_3 students are assigned in pairs to a senior high school science class with the expectation that they will have regular opportunities to conduct laboratory activities. While the student may, at times, work with his cooperating teacher as a laboratory assistant he should also be responsible for teaching five laboratory activities to the total class. The J_3 student should work closely with the cooperating teacher in planning appropriate laboratory work, conducting the activities, and assessing the results.

Seminars continue to be held once a week with J_3 students, school personnel, and university staff members participating. Seminar problems focus on total classroom activities, methods and strategies for inquiry teaching in a laboratory setting, evaluation techniques for laboratory activities, problems of adolescents, dynamics of group interaction, and the philosophy and operation of a specific senior high school.

Activities:

1. Work twice weekly with an entire class in a laboratory activity.
2. Develop sound lesson plans for inquiry-oriented laboratory activities to be taught.
3. Continue, on campus, with activities which deal with laboratory and field skills and techniques needed for teaching in their areas of specialization. Also included are activities designed to develop skill in using office machines, AV materials, and in developing evaluation instruments.

4. Prepare work sheets, study guides, quizzes, transparencies or other instructional materials useful in teaching the scheduled laboratory activities.

5. Develop and use methods of evaluating student progress without resorting to paper and pencil tests.

6. Evaluate the laboratory facilities, equipment, and materials available in the school.

7. With the aid of the school librarian review the supplemental or enriching materials available. Try to determine how these are and may be used by teachers and students.

8. Ascertain the attitudes of various kinds of students toward the school's program.

9. Observe at least six teachers in operation in their classrooms. Try to determine (a) their approach to content, (b) their interaction with students, (c) their techniques of classroom management and (d) their general level of satisfaction with being high school teachers.

10. Observe the general socio-economic status of the families living in the school attendance area.

Typical Readings:

Bloom	The Taxonomy of Educational Objectives
Hedges	Testing and Evaluation for the Sciences in Secondary Schools
Sund and Trowbridge	Teaching Science by Inquiry in the Secondary School
Edwin J. Swineford	Critical Teaching Strategies
Thurber and Collette	Teaching Science in Today's Secondary Schools

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Faculty of Science and
Mathematics Education

(614) 422-4121

TO: Cooperating Public School Personnel and Ohio State University Undergraduate Students in Science-Mathematics Education

FROM: Faculty in Science-Mathematics Education

DATE: Summer 1972

SUBJECT: General Description of Pre-Student Teaching, (S_1) Program

Courses:

Mathematics Majors

Education 546, four credit hours
Education 621, four credit hours
Education 640.73, three credit hours
Education 694.41, three credit hours
Education 694.26, three credit hours

Science Majors

Education 627, three credit hours
Education 640.73, three credit hours
Education 94.41, three credit hours
Education 694.27, five credit hours
Education 693.27, three credit hours

Foci:

The influence of contrasting communities and differing grade levels on teaching-learning in secondary schools.

A problem solving stance toward pedagogical problems in mathematics and science education.

The nature of mathematics and science to be considered in developing student activities.

Objectives: The S_1 student will:

1. Develop an understanding of the underlying cultural elements characterizing urban, suburban, and rural areas and their impact on the schools.

2. Develop sensitivity to the differences in cultural backgrounds of students and the effect of these differences on learning.

3. Re-examine similarities and differences between junior and senior high school students and the educational programs offered to each.

4. Acquire understanding of the origin and nature of the charge made by some critics that the public school system is racist and irrelevant and does not meet the needs of groups such as innercity blacks.

5. Acquire a sense of the political workings and functioning of a department, school, and school system.

6. Become more aware of the nature of good teaching and the characteristics of "good teachers" as perceived by high school students.

7. Acquire skill and insight into using the nature of mathematics and/or science as a guide and tool in planning student activities.

8. Develop insights and skills involved in long and short term planning for teaching.

9. Acquire insight regarding how students' cultural influences and learning capabilities should guide the selection of instructional objectives, activities, materials, and methods.

10. Become able to interpret test scores from teacher made and standarized tests, apply statistical techniques to test construction and use this information to improve the teaching-learning situation.

11. Become able to analyze a video-tape or audio tape of his teaching to gain insight into verbal and non-verbal behavior - his teaching "style." Demonstrate the ability to evaluate his teaching performance.

12. Explore the possibilities and especially the problems of working in "teaching teams."

13. Gain a spirit of professionalism which includes striving for considered changes and improvements.

14. Continue to achieve, at a higher level, many of the objectives previously listed as appropriate for J_1, J_2, and J_3 programs.

Program:

S_1 students will be assigned in pairs to work with cooperating teachers as teaching assistants for four weeks in an inner-city school and an equal time in an outer-city school. The S_1 students will assist teachers and engage in other activities in the schools four periods a day, five days per week.

The college seniors will be able to provide considerable help as junior members of "instructional teams." They can prepare and conduct demonstrations, assist in laboratory work, prepare guidesheets or other instructional materials, assist in evaluating pupil progress, and work with individuals and small groups in need of special help. In addition the senior will get an opportunity to teach an entire class several times during his four weeks of heavy involvement in each school.

Seminars which focus on understanding school based experiences in a framework of principles, practices, and philosophies of secondary education will be held twice a week. In addition to the seminars there will be regular classwork in philosophy and/or sociology of education. S_1 students will also continue to study special methods of teaching mathematics for science and develop instructional materials which they can use in the schools or in their future teaching.

Students will be expected to become aware of many of the "realities of public schools" by observing widely throughout the school, by talking with many school personnel, by informal conversations with pupils, by attending after school or evening functions such as faculty or PTA meetings, and by studying the socio-economic factors in operation in the school's attendance area. Students will also be introduced to the educational problems and practices found in other places such as the Cleveland Public Schools and the Fairfield School for Boys.

Specialists from areas such as urban sociology, mental health, juvenile deliquency as well as educational personnel from the Columbus public schools will be involved as resource personnel for on-campus discussions about educational problems.

Each S_1 student will keep a "log" which will be a personalized record of his experiences during the quarter with particular emphasis on analyzing, interpreting, and evaluating the experiences.

Activities:

1. Accomplish at a continuously higher level many of the activities specified for J_1, J_2, and J_3 programs.

2. Work daily (half-days) for eight weeks in two contrasting secondary schools with cooperating teachers, assisting with the instructional and evaluation programs for these teachers' classes.

3. Observe widely throughout the schools to become more knowledgeable about the programs, practices, and problems in each. This entails attendance at school functions such as school assemblies, athletic events, school club groups and informal activities such as spending some time in the school's faculty lounge.

4. Confer with guidance personnel, instructional coordinator, visiting teachers, students, school administrative personnel, and others concerning the school's socio-economic nature and community attitudes toward school. Hopefully this would include some "touring" of the schools' attendance area and visiting in some homes.

5. Read widely on topics such as the education of disadvantaged learners, alienated youth, problems of urban education, philosophy and sociology of education. Participate in seminar discussions which will draw on such literature to help clarify questions which grow out of participation in public school programs.

6. Write a comprehensive log in which will be produced a personalized record of his experiences throughout the quarter. Emphasis is to be placed on analyzing, interpreting, and evaluating the experiences.

7. Read widely in the specialized literature of science or mathematics education.

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Faculty of Science and
Mathematics Education

(614) 422-4121

TO: Cooperating Public School Personnel and Ohio State University Undergraduate Students in Science-Mathematics Education

FROM: Faculty of Science-Mathematics Education

DATE: Summer 1972

SUBJECT: General Description of Student Teaching (S_2) Program

Course: Education 587.26, fifteen credit hours (mathematics majors)
Education 587.27, fifteen credit hours (science majors)
Education 693.26, two credit hours (mathematics majors)
Education 693.27, two credit hours (science majors)

Focus: A successful student teaching experience which integrates previous professional learnings.

Objective:

1. Integrate and utilize the skills and understandings developed through involvement previously in the J_1, J_2, J_3 and S_1 programs.
2. Test and evaluate instructional ideas through classroom application.
3. Become familiar with and active on a full time basis in the school-community setting.
4. Identify community resources in his school's attendance area and in larger community which are available and useful in developing his instructional program.
5. Use evaluation feedback in dealing with parental concerns relative to their child's growth and development.

Program:

The S_2 student may be assigned to full time student teaching with a cooperating teacher he has worked with the previous quarter. In this situation he should be able to take immediate responsibility for two classes and very quickly assume total responsibility for three classes. The remainder of his time in the school should be used to broaden understanding and competency by (1) working with other teachers in his discipline in the school, (2) observing other teachers and students in a wide variety of situations, (3) helping with the extra curricular activity program, (4) supervising study halls and lunchrooms, (5) helping with testing, grading, and record keeping responsibilities, and, in general doing almost everything that will be expected of him as a regular teacher. Several days near the end of the S_2 quarter the senior should assume the full teaching and supervisory load carried by regular teachers.

While providing a model of good teaching, it is hoped that the cooperating teacher, working with the student and with the college supervisor, will help the student develop his personalized style of teaching, which may be similar to or quite different from that of his cooperating teacher.

It is anticipated that the cooperating teacher and senior will plan a sizeable number of teaching situations in which they work together as an instructional team, thereby enriching instruction and, hopefully, learning from each other.

The cooperating teacher is expected to regard himself as a very important part of a teacher education team working with the college supervisor and others to prepare better science and mathematics teacher. In this process, he must be involved regularly in planning for and evaluating growth toward this objective.

Activities:

1. Engage in a full time student teaching experience for one quarter initially taking responsibility for two classes and quickly a third one.

2. Plan with the cooperating teacher a number of teaching situations in which they work together as an instructional team.

3. With the aid of cooperating teacher and college supervisor engage in careful self-examination of strengths and weaknesses as a teacher.

4. Use community resource personnel to obtain judgments concerning their satisfaction with the school's program and to enrich the instructional program if feasible.

5. Discuss with public school and college teachers issues, concerns, practices, and policies in secondary education for the purpose of clarifying his own position on these matters.

FACULTY OF SCIENCE AND MATHEMATICS EDUCATION
Secondary Curriculum Planning Guide
Biological Science (Comprehensive)
(90 Hours)

Revised 1/74

NAME ______________________ ADVISER ______________ DATE ____

GENERAL REQUIREMENTS

		Hrs	Grade
Physical Education		1	
(3 qtrs)		1	
		1	
English	100	5	
PC Military Science		2	
A (6 qtrs)		2	
		2	
		2	
		2	
		2	
PC *12 hrs of electives			
B			
Mathematics	150	5	
(or equivalent)			

BASIC EDUCATION REQUIREMENTS

Science: (15 hours)			
SATISFIED BY MAJOR		5	
		5	
		5	
*Social Science: (15 hours)			
Psychology	100	5	
		5	
		5	
*Humanities: (15 hours)			

*See College Bulletin

Section A	(45 hours)		
		Hrs	Grade
Biology	100	5	
Biology	101	5	
Zoology	313	5	
Microbiology	640	5	
Genetics	500	5	
Microbiology		5	

Electives Supporting Major (15 hours)**			
		5	
		5	
		5	

Section B - Related Science (45 hours)			
Group One			
Chemistry	121	5	
Chemistry	122	5	
Chemistry	123	5	
Chemistry	241	3	
Chemistry	242	3	
Biochemistry	511	4	
Group Two			
Physics	111	5	
Physics	112	5	
Group Three			
Geology	101	5	
Geology	102	5	

**200 level or above; not more than two courses to be taken from any one biological science area.

PROFESSIONAL REQUIREMENTS

			Hrs	Grad
J1	Education			
	Education			
J2	Education			
	Education			
J3	Education			
	Education			
S1	Education			
	Education			
	Education			
	Education			
S2	Education			
	Education			

FACULTY OF SCIENCE AND MATHEMATICS EDUCATION
Secondary Curriculum Planning Guide
General Science (Comprehensive)
(85 Hours)

Revised 1/73

NAME ______________________

ADVISER ______________ DATE ____

GENERAL REQUIREMENTS

			Hrs	Grade
	Physical Education		1	
	(3 qtrs)		1	
			1	
	English	100	5	
Opt A	Military Science		2	
	(6 qtrs)		2	
			2	
			2	
			2	
			2	
Opt B	*12 hrs of electives			
	Mathematics	150	5	
	(or equivalent)			

BASIC EDUCATION REQUIREMENTS

Science: (15 hours)			
SATISFIED BY MAJOR		5	
		5	
		5	
*Social Science: (15 hours)			
Psychology	100	5	
		5	
		5	
*Humanities: (15 hours)			

*See College Bulletin

Section A - Biological Sci (20 hours)			
		Hrs	Grade
Biology	100	5	
Biology	101	5	
Microbiology	509	5	

Elec Supporting Section A (5 hours)**			
		5	

Section B - Chemistry (20 hours)			
Chemistry	121	5	
Chemistry	122	5	
Chemistry	123	5	

Elec Supporting Section B (5 hours)**			
		5	

Section C - Earth Science (20 hours)			
Astronomy	150	5	
Geology	101	5	
Geology	102	5	

Elec Supporting Section C (5 hours)**			
		5	

Section D - Physics (20 hours)			
Physics	111	5	
or Physics	131	5	
Physics	112	5	
or Physics	132	5	
Physics	113	5	
or Physics	133	5	

Elec Supporting Section D (5 hours)**			
		5	

**200 level or above

PROFESSIONAL REQUIREMENTS

			Hrs	Grade
J_1	Education			
	Education			
J_2	Education			
J_3	Education			
S_1	Education			
	Education			
	Education			
	Education			
S_2	Education			

Section E - Related Science (5 hours)**			
		5	

FACULTY OF SCIENCE AND MATHEMATICS EDUCATION
Secondary Curriculum Planning Guide
Earth Science (Comprehensive)
(80-83 Hours)

Revised 1/73

NAME ______________________ ADVISER ______________________ DATE ____

GENERAL REQUIREMENTS

			Hrs	Grade
	Physical Education		1	
	(3 qtrs)		1	
			1	
	English	100	5	
Opt A	Military Science		2	
	(6 qtrs)		2	
			2	
			2	
			2	
			2	
Opt B	*12 hrs of electives			
	Mathematics	150	5	
	(or equivalent)			

BASIC EDUCATION REQUIREMENTS

Science: (15 hours)			
~~SATISFIED BY MAJOR~~		~~5~~	
		~~5~~	
		~~5~~	
*Social Science: (15 hours)			
Psychology	100	5	
		5	
		5	
*Humanities: (15 hours)			

*See College Bulletin

Section A - Earth Science (50-53 hrs)			
		Hrs	Grade
Astronomy	1[illegible]0	5	
Geology	101	5	
Sec. 37	[illegible]	5	
Geology	[illegible]	5	
Geology	202	3	
Geology	550	5	
Geology	204	5	
or Geology	[illegible]	3	
Physics	[illegible]	5	
or Geography	520	4	

Environmental Study and Research Ctr			
Geology	580	5	
Geology	[illegible]	5	
Natural Resources	[illegible]	5	

Section B - Related Sciences (30 hrs)			
Group One			
Biology	100	5	
Biology	101	5	

Group Two			
Chemistry	121	5	
Chemistry •	122	5	

Group Three			
Physics	111	5	
Physics	112	5	

PROFESSIONAL REQUIREMENTS

			Hrs	Grad
J_1	Education			
	Education			
J_2	Education			
J_3	Education			
S_1	Education			
	Education			
	Education			
	Education			
S_2	Education			

Revised 1/73

FACULTY OF SCIENCE AND MATHEMATICS EDUCATION
Secondary Curriculum Planning Guide
Physical Science (Comprehensive)
(86 Hours)

NAME ______________________

ADVISER ______________________ DATE ____

GENERAL REQUIREMENTS

			Hrs	Grade
	Physical Education		1	
	(3 qtrs)		1	
			1	
	English	100	5	
Opt A	Military Science		2	
	(6 qtrs)		2	
			2	
			2	
			2	
			2	
Opt B	*12 hrs of electives			

BASIC EDUCATION REQUIREMENTS

Science: (15 hours)			
		5	
(10 hours satisfied by major)			
*Social Science: (15 hours)			
Psychology	100	5	
		5	
		5	
*Humanities: (15 hours)			

*See College Bulletin

Section A - Chemistry (31 hours)		Hrs	Grade
Chemistry	121	5	
Chemistry	122	5	
Chemistry	123	5	
Chemistry	521	5	
Plus 11 hrs minimum of the following:			
Chemistry	211/212	3/3	
or Chemistry	221	5	
Chemistry	241	3	
Chemistry	242	3	
Chemistry	243	3	
Chemistry	244	3	

Section B - Physics (30 hours)			
Physics	131	5	
Physics	132	5	
Physics	133	5	
Physics	241	3	
Physics	516	4	
Physics	251	3	
or Physics	580.01	3	
Plus 5 hrs minimum of the following:			
Physics	525	4	
Physics	595	1	
Physics	616	4	

Section C - Mathematics (25 hours)			
Mathematics	151	5	
Mathematics	152	5	
Mathematics	153	5	
Mathematics	254	5	
Mathematics	255	5	
or Mathematics	556	5	

PROFESSIONAL REQUIREMENTS

			Hrs	Grade
J_1	Education			
	Education			
J_2	Education			
J_3	Education			
S_1	Education			
	Education			
	Education			
	Education			
S_2	Education			

APPENDIX F

DATA ON CAST:SP AND CAST:PP FROM FORTAP (RAVE)

NEW WEIGHTINGS FOR RESPONSE CHOICES ON CAST:SP FOR OPTIMUM HOYT RELIABILITY ESTIMATE GENERATED BY FORTAP (RAVE) PROGRAM

Item	Revised Weightings According to Response Choices	Frequency of Responses Given for Each Choice 1	2	3	4	5
1	04321	0	9	21	29	27
2	05431	0	1	7	29	49
3	53432	2	2	3	18	61
4	55421	5	2	8	50	21
5	04321	0	12	27	4	43
6	54321	3	8	19	26	30
7	55431	1	4	7	37	37
8	05322	0	2	12	40	32
9	05321	0	3	26	32	25
10	05321	0	2	19	32	33
11	04431	0	3	9	30	44
12	53321	5	2	27	32	20
13	54421	4	2	6	54	20
14	55421	2	3	10	38	33
15	05421	0	1	11	39	35

OPTIMUM HOYT RELIABILITY ESTIMATE FOR CAST:SP

GENERATED BY FORTAP (RAVE) PROGRAM

Source	DF	Sum of Squares	Mean Square	F	R and SE
Individuals	85	584.054687	6.87123108	10.2595291	0.9025
Items	14	24.6093750	1.75781250	2.62461376	3.0621
Error	1190	796.992187	0.669741333		
Total	1289	1405.65625			

NEW WEIGHTINGS FOR RESPONSE CHOICES ON CAST:PP FOR OPTIMUM HOYT RELIABILITY ESTIMATE GENERATED BY FORTAP (RAVE) PROGRAM

Item	Revised Weightings According to Response Choices	Frequency of Responses Given for Each Choice				
		1	2	3	4	5
1	54221	14	120	480	155	225
2	55321	38	91	133	279	453
3	54431	33	94	114	159	594
4	54321	90	83	109	459	253
5	54321	28	151	336	79	400
6	43321	156	181	164	236	257
7	45321	71	89	235	276	323
8	54321	66	69	243	301	315
9	54321	71	155	327	216	225
10	54321	96	107	187	286	318

OPTIMUM HOYT RELIABILITY ESTIMATE FOR CAST:PP

GENERATED BY FORTAP (RAVE) PROGRAM

Source	DF	Sum of Squares	Mean Square	F	R and SE
Individuals	993	4895.93359	4.93044662	4.64089870	0.7845
Items	9	282.312500	31.3680420	29.5259094	3.0922
Error	8937	9494.58984	1.06239033		
Total	9939	14672.8359			

APPENDIX G

CORRELATION MATRIX

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CORRELATION MATRIX

          COL.       COL.       COL.       COL.       COL.       COL.       COL.       COL.
  ROW      1          2          3          4          5          6          7          8

    1    1.0000     0.2168    -0.0119     0.3182     0.3738    -0.0266    -0.0259    -0.0197
    2    0.2168     1.0000     0.0869     0.1591     0.0748     0.0659     0.0572    -0.1169
    3   -0.0119     0.0869     1.0000     0.1610    -0.1503     0.0364     0.0585     0.1237
    4    0.3182     0.1591     0.1610     1.0000     0.1270    -0.0256    -0.0095    -0.0915
    5    0.3738     0.0748    -0.1503     0.1270     1.0000    -0.0494    -0.0338     0.0877
    6   -0.0266     0.0659     0.0364    -0.0256    -0.0494     1.0000     0.0634     0.1620
    7   -0.0259     0.0572     0.0585    -0.0095    -0.0338     0.0634     1.0000     0.1754
    8   -0.0197    -0.1169     0.1237    -0.0915     0.0877     0.1620     0.1754     1.0000
    9   -0.0341    -0.2234     0.0318    -0.0641     0.1631    -0.0651    -0.1020     0.5687
   10    0.0111    -0.1523     0.1598    -0.0649    -0.0410     0.1217     0.1062     0.4420
   11   -0.1912    -0.2203     0.1910    -0.0626     0.0045    -0.1061    -0.0646     0.2225
   12   -0.0648     0.2365     0.1664     0.1745     0.1490    -0.0620    -0.1057    -0.0357
   13    0.0725     0.1384     0.1793     0.0927     0.1321     0.2298     0.1094    -0.0618
   14   -0.0572    -0.0222    -0.0445     0.1728     0.0680    -0.0074    -0.0038     0.0191
   15   -0.0915    -0.0932    -0.0515     0.2149     0.0130     0.2441     0.2671     0.0526
   16    0.0651    -0.0234    -0.1959     0.1150     0.0413    -0.0788    -0.1031     0.0328
   17    0.0733    -0.0067    -0.1001    -0.0046    -0.0645     0.1500     0.0405     0.1333
   18   -0.1423    -0.1575    -0.0564     0.1161    -0.1076     0.0760     0.0213     0.0275
   19   -0.1455    -0.1646    -0.0855     0.1167    -0.0978     0.0548     0.0317     0.0146
   20    0.0666     0.1408    -0.0456     0.0538     0.1496    -0.0672    -0.0065    -0.1656
   21    0.1054    -0.0894    -0.1648     0.0269     0.0797     0.0617     0.0504    -0.0347
   22    0.0467     0.0233     0.0125     0.0330    -0.0598     0.1671     0.1416     0.2214
   23   -0.1972     0.0643     0.1113     0.0560    -0.2284    -0.0940    -0.1009     0.0387
   24    0.4173     0.2164    -0.2815    -0.2243     0.3608     0.2203     0.1474    -0.0144
   25   -0.0109    -0.0572    -0.0089     0.1467     0.1312     0.1367     0.1557     0.0240
   26    0.0118    -0.0697     0.1356     0.0547     0.1705     0.2157     0.1971     0.0456
   27   -0.0395    -0.0202     0.0209    -0.0371     0.2153     0.1650     0.1376     0.0016
   28    0.0392    -0.0072     0.0561     0.0305     0.1347     0.1105     0.1615    -0.0158
   29   -0.1097    -0.0723    -0.0351     0.0360     0.0507     0.0045    -0.0058    -0.0528
   30   -0.1265    -0.1201     0.0262    -0.0403     0.0997    -0.0518    -0.0569    -0.0272
   31   -0.0299    -0.0627    -0.0032     0.0552     0.0750    -0.0755    -0.0474    -0.0461
   32    0.0876     0.0123     0.1377     0.1072     0.1542     0.0235     0.0651     0.0741
   33   -0.0885    -0.0297    -0.0590    -0.0744    -0.1430     0.0377    -0.0036     0.0777
   34    0.0190    -0.0179    -0.1252    -0.0472    -0.0521    -0.1041    -0.1041    -0.1473
   35    0.0634    -0.1368    -0.1196     0.0094    -0.0730    -0.0187    -0.0570     0.0747
   36    0.1088    -0.0638    -0.0744     0.0225    -0.0765     0.0148    -0.0540     0.0647
   37    0.1076     0.0446     0.1995     0.0542     0.0549     0.0045     0.0215     0.0148
   38    0.0489    -0.0161    -0.0865    -0.0047    -0.0548    -0.0124    -0.0217     0.0643
   39    0.1573    -0.0152    -0.0771     0.1059     0.0907     0.1558     0.1450     0.1331
   40   -0.4250    -0.0282     0.0009    -0.3308     0.0691     0.0731     0.0568    -0.0116
   41   -0.0449     0.0225     0.2633     0.1531    -0.0204     0.0511     0.1271     0.0041
   42    0.0003     0.1276     0.2847     0.0785     0.0014    -0.0151     0.0587     0.1270
   43    0.0134     0.1196     0.1679     0.1968     0.0068     0.0615     0.1302    -0.0063
   44   -0.1144     0.1183     0.1115     0.1201    -0.0493     0.0121     0.0230     0.0458
   45    0.0751    -0.0018     0.1122     0.2401    -0.0552    -0.1294    -0.1158     0.0510
   46    0.0134    -0.1026    -0.0210    -0.0361     0.0574    -0.0028    -0.0469    -0.1326
   47   -0.1130    -0.0309    -0.0076     0.1778    -0.0325    -0.2054    -0.1953     0.0009
```

O.C.

48	-0.1218	-0.0532	0.0223	-0.0867	-0.0815	-0.0751	-0.0906	-0.0797
49	0.0195	0.0240	-0.1485	-0.0003	0.0663	0.1253	0.1101	0.0076
50	0.0538	-0.1664	0.1505	0.0812	-0.0454	-0.0347	0.0706	-0.1655
51	-0.1054	-0.0070	-0.1140	-0.0554	-0.0942	0.1247	0.1399	0.0509
52	-0.1258	-0.0861	-0.0168	0.0263	-0.0295	0.1027	0.1361	0.0348
53	-0.0361	-0.0810	-0.1620	-0.1147	0.0078	-0.1827	-0.1600	0.1044
54	-0.0476	-0.0429	-0.0922	-0.0709	-0.0781	0.0422	-0.0259	0.0662
55	-0.1075	-0.2404	-0.0727	-0.0661	-0.0474	-0.0606	-0.0092	0.1019
56	-0.0377	0.0646	-0.0800	-0.1036	-0.0265	-0.1331	-0.1147	0.0054
57	0.1176	-0.0581	-0.0427	-0.0959	0.0022	-0.1200	-0.1761	0.0765
58	-0.0296	0.0473	-0.1459	-0.1652	-0.2026	0.3190	0.2430	-0.0327
59	0.1697	-0.0031	-0.0932	0.0555	-0.0090	0.0068	0.3375	-0.0272
60	-0.1314	-0.2124	0.0469	-0.1315	-0.1262	0.0720	0.0575	0.0977
61	-0.1492	-0.0101	0.0332	-0.0972	-0.1164	0.2147	0.2167	-0.0350
62	-0.0726	0.0726	0.1258	-0.0282	0.0762	0.1000	0.1450	-0.1037
63	0.1533	0.0709	0.0557	0.0319	0.0428	0.2469	0.2647	-0.1249
64	0.1734	0.1647	-0.1141	-0.0905	0.0029	0.0742	0.1268	-0.0913
65	-0.0570	-0.0235	0.1122	0.0310	0.0205	-0.0178	-0.0617	0.1441
66	0.1909	0.0826	0.1467	0.0163	-0.0176	-0.1154	-0.0735	-0.0633
67	0.1672	0.0726	0.0541	0.1742	0.0265	0.0549	0.0921	-0.0155
68	-0.0189	-0.1314	-0.0650	0.1657	0.1178	0.0523	0.0241	0.2064
69	-0.1083	-0.0573	0.0511	0.1162	0.0575	-0.0319	0.0195	0.0704
70	-0.0602	-0.0452	0.0341	0.0332	-0.0568	-0.0659	-0.1387	-0.0165
71	-0.0238	0.1569	-0.1005	0.0717	-0.0184	-0.0742	-0.0429	-0.1031
72	-0.1012	-0.2193	-0.0611	0.0637	-0.0492	-0.0580	-0.0963	0.0563
73	-0.0946	-0.1967	-0.1409	-0.0523	0.0614	-0.1217	-0.1172	0.0566
74	0.1107	-0.0651	0.0087	0.0166	-0.1645	-0.0704	-0.0420	-0.1129
75	-0.2106	-0.2907	-0.0965	-0.1143	0.0050	0.0103	-0.0777	-0.0183
76	0.0158	-0.1137	-0.1932	0.0107	0.0732	0.0154	-0.0611	0.0266
77	0.1212	-0.0224	0.0654	0.1201	0.0951	0.0596	0.0898	0.1476
78	0.0161	0.0446	-0.1468	0.0616	0.1817	0.0540	0.0565	0.0295
79	-0.0483	0.0184	-0.0605	-0.0965	0.0109	-0.1859	-0.1744	-0.0112
80	-0.0514	0.0642	-0.0202	0.0318	0.1053	0.0541	0.0327	0.1795
81	-0.0707	-0.1030	-0.0996	-0.0376	-0.0414	-0.0560	-0.0628	0.0464
82	-0.0161	0.2373	0.0998	0.0481	0.1303	-0.0732	-0.0527	-0.0364
83	-0.0792	0.1517	0.0763	-0.0415	0.0502	0.0094	0.0226	0.0114
84	0.1150	0.0745	0.0291	0.1160	0.1892	0.0697	0.0963	0.0091
85	0.1463	-0.0020	0.0347	0.0449	0.0495	0.0727	0.1319	-0.1024
86	0.0744	0.2226	0.1183	-0.0048	0.0698	0.0336	0.0392	-0.1443
87	0.1002	0.1311	0.1756	0.0309	0.1092	-0.0240	0.0559	-0.0314
88	-0.0214	0.0192	0.0749	-0.0411	0.1404	0.1394	0.1469	-0.0284
89	-0.1665	-0.1019	0.0690	0.2428	-0.1727	-0.0062	0.0563	0.1038
90	-0.1691	-0.2584	-0.0034	-0.0707	-0.0954	-0.0168	0.0026	-0.0454
91	0.0405	-0.2452	-0.0132	-0.0908	0.0536	0.0160	0.0934	0.0369
92	0.0142	-0.0543	0.2760	0.1371	-0.0934	-0.0385	-0.0147	-0.0684
93	0.0285	0.0477	-0.1107	0.0639	-0.1819	-0.0635	-0.0228	0.0763
94	0.0242	0.1036	-0.0207	0.0760	-0.0497	-0.0625	-0.0055	0.1361
95	0.0607	0.0477	-0.1107	0.0679	-0.0557	-0.0782	-0.0228	0.1140
96	0.1502	0.0278	0.0967	0.1161	0.0473	-0.0663	-0.0154	0.2151
97	0.0759	0.0452	-0.0908	0.1197	0.0269	-0.0277	-0.0087	0.0700
98	0.1353	-0.1692	0.2692	0.1506	-0.0680	-0.1412	-0.1361	0.0795
99	-0.2070	0.1195	-0.1162	0.0199	-0.1291	0.0435	0.0419	-0.0246
100	0.0416	0.0546	0.0781	0.2257	0.1116	-0.0394	-0.0762	-0.0563
101	-0.0725	0.0471	0.1320	-0.0387	0.1041	0.1619	0.1855	0.0652
102	0.0350	-0.1022	0.0237	0.1626	0.0098	0.1042	0.1113	-0.0114
103	0.0349	0.1648	0.0790	0.1259	0.0076	0.0158	0.0153	0.0529
104	0.0232	-0.0561	0.1656	0.0342	0.0377	0.1584	0.1630	-0.0441
105	-0.1057	0.0076	-0.0251	-0.1775	0.0045	0.1249	0.1565	-0.1192
106	0.0472	0.0079	0.1639	0.1567	0.0826	0.2546	0.2611	0.1220
107	0.0432	0.0196	0.1376	0.0539	0.0572	0.1155	0.1165	0.0530
108	-0.0153	0.0483	0.0144	0.1493	0.0823	-0.0200	-0.0093	-0.0053
109	-0.2145	-0.0967	0.0789	-0.0683	-0.0853	0.0089	0.0587	0.2116
110	0.1588	0.0352	0.0503	0.1824	0.0209	-0.2235	-0.2501	-0.0246
111	-0.0438	-0.0375	-0.1231	-0.1195	-0.0907	-0.0665	-0.1037	-0.0218
112	-0.0363	0.0276	-0.0694	-0.0143	0.0220	-0.1784	-0.2521	-0.0050
113	-0.0627	0.1475	0.1950	0.1956	-0.0536	0.1621	0.1616	-0.1210
114	-0.0771	-0.1563	-0.0251	-0.1726	0.0045	-0.2216	-0.2226	0.0517
115	-0.0969	-0.1158	-0.0596	-0.0849	-0.0936	0.0709	0.1029	0.1095

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      116    0.2795      0.1100     -0.1920      0.0434      0.1532      0.0054     -0.0497      0.0134
      117   -0.0093      0.0902      0.1487      0.1014      0.0283      0.1762      0.1817      0.0891
      118    0.0671      0.1010      0.0603      0.0525      0.0268      0.0728      0.0596      0.0723
O.C.  119    0.0336      0.1219      0.1178      0.1082      0.0490      0.0879      0.1260      0.1070
      120    0.0108      0.0265     -0.0023      0.0953      0.0285      0.1121      0.1397      0.0894
      121   -0.0235     -0.0383      0.0042      0.1434      0.0709      0.1764      0.1821      0.2663
      122   -0.0261      0.2260     -0.0927     -0.0355     -0.0232      0.1412      0.1762      0.0622
      123   -0.0119      0.0834     -0.0350      0.0766      0.0283      0.1631      0.1705      0.1566
      124   -0.0516      0.1305      0.1924      0.0965      0.0848      0.1146      0.1745     -0.0204

             COL.        COL.        COL.        COL.        COL.        COL.        COL.        COL.
              9          10          11          12          13          14          15          16
      ROW

        1   -0.0341      0.0111     -0.1913     -0.0046      0.0725     -0.0372     -0.0915      0.0061
        2   -0.2234     -0.1523     -0.3203      0.2365      0.1384     -0.0222     -0.0932     -0.0239
        3    0.0318      0.1598      0.1910      0.1664      0.1703     -0.0445     -0.0515     -0.1059
        4   -0.0641     -0.0649     -0.0666      0.1746      0.0927      0.1228      0.2149      0.1180
        5    0.1421     -0.0430      0.0045      0.1590      0.1321      0.0680      0.0120      0.0413
        6   -0.0851      0.1217     -0.1061     -0.0820      0.2298     -0.0034      0.2483     -0.0788
        7   -0.1020      0.1053     -0.0546     -0.1057      0.1595     -0.0038      0.2435     -0.1033
        8    0.5687      0.8829      0.2225     -0.0397     -0.0015      0.0191      0.0529      0.0324
        9    1.0000      0.5065      0.4138      0.0706      0.0197      0.3275      0.2106      0.1649
       10    0.5065      1.0000      0.1746     -0.0781      0.0428     -0.0007      0.1014      0.0041
       11    0.4138      0.1746      1.0000      0.1315      0.0236      0.1113      0.0736      0.1851
       12    0.0706     -0.0781      0.1315      1.0000      0.3537      0.0535      0.1171      0.2510
       13    0.0197      0.0428      0.0236      0.3537      1.0000      0.0262      0.2468      0.0995
       14    0.3275     -0.0007      0.1113      0.0535      0.0262      1.0000      0.5226      0.3879
       15    0.2106      0.1014      0.0736      0.1171      0.2468      0.5226      1.0000      0.2593
       16    0.1649      0.0041      0.1851      0.2510      0.0995      0.3879      0.2593      1.0000
       17    0.1363      0.1904     -0.1277      0.1163      0.1870     -0.0417      0.0993      0.0734
       18    0.0816     -0.0358     -0.0556     -0.0024     -0.1575      0.0828     -0.0772     -0.1751
       19    0.0964     -0.0415     -0.0429     -0.0268     -0.1725      0.0830     -0.0560     -0.1659
       20   -0.0137     -0.2337      0.0125     -0.0934     -0.2655      0.1071     -0.0065     -0.0301
       21   -0.1160     -0.0393     -0.1561     -0.1291      0.0661     -0.0714     -0.0052     -0.1042
       22    0.2345      0.2387    [illegible]   0.0098      0.0890      0.3082      0.2752      0.4164
       23    0.0158      0.1843     -0.0132     -0.0005     -0.0551      0.0553     -0.0340      0.1104
       24   -0.0113     -0.0036     -0.1430     -0.1031     -0.0127     -0.0312      0.0629      0.0561
       25   -0.0458      0.0888      0.2777      0.0451      0.1594      0.0272     -0.0062      0.0063
       26    0.0900      0.1459      0.1715      0.0578      0.2261      0.0376      0.0160     -0.0516
       27    0.1560      0.1856      0.0444      0.0137      0.1916      0.1570      0.1190      0.0080
       28    0.0411      0.0657      0.0794      0.0139      0.1533      0.0661     -0.0005      0.0426
       29    0.0605      0.0054      0.1442     -0.0434      0.1004      0.0448      0.0947      0.0617
       30    0.0367      0.0257      0.1841     -0.0799      0.1064      0.0815      0.0630      0.0808
       31    0.0125      0.0639      0.1582     -0.1610      0.0437      0.0791      0.0411      0.1026
       32    0.0350      0.0153      0.0487      0.0532      0.3180     -0.0174      0.0253     -0.1014
       33    0.0264      0.1086     -0.0287      0.0171     -0.1910      0.0765      0.0357      0.0579
       34   -0.0370     -0.1287      0.0031     -0.1558     -0.2195     -0.1340     -0.0445      0.1257
       35    0.0445      0.1220     -0.0814      0.1345      0.0807     -0.1325      0.0601      0.0572
       36    0.0496      0.1227     -0.0617      0.0779      0.1472     -0.0328      0.1257     -0.0156
       37   -0.1177     -0.0591     -0.0264      0.0140      0.1749     -0.1173     -0.1415     -0.2486
       38    0.0872      0.0735     -0.0235      0.0176      0.2098     -0.0343      0.1691     -0.0415
       39    0.0149      0.1671      0.0313      0.0022      0.3211      0.1084      0.2104      0.1842
       40    0.0435     -0.0529      0.1984     -0.0456      0.0979     -0.0308      0.0519     -0.1041
       41   -0.0944     -0.0266      0.2299      0.1866      0.2264     -0.0922     -0.0246     -0.0817
       42    0.0057      0.0548      0.2021      0.1512      0.1977     -0.0946     -0.0911     -0.0764
       43   -0.1766     -0.0545      0.0685      0.0531      0.0579     -0.0576     -0.1597     -0.1863
       44    0.2157      0.0603      0.1310      0.0947      0.1691      0.0333      0.1711     -0.1119
       45    0.1714      0.0164      0.1769      0.2476      0.2385      0.0126      0.0946      0.0029
       46   -0.0781     -0.1651     -0.0102     -0.0520     -0.1218     -0.0324     -0.1524      0.0147
       47   -0.0930      0.0430     -0.1514      0.1279      0.0689     -0.0502      0.0541      0.0484
       48    0.0262     -0.0413      0.2591      0.0917     -0.1714     -0.0802     -0.1521      0.0660
       49    0.0446      0.0665      0.1061     -0.0362     -0.0666      0.0494      0.0737      0.0745
       50   -0.0687     -0.1476      0.2153     -0.0066      0.0182     -0.0415     -0.0763      0.0412
       51    0.0417      0.0711     -0.0188     -0.0097     -0.0124     -0.0699      0.0023     -0.1003
       52    0.0720      0.0649     -0.0571     -0.3057     -0.0114     -0.1024     -0.0050     -0.2357
       53    0.0022      0.0411     -0.0538     -0.0503     -0.1765      0.0218     -0.0516     -0.0693
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54	0.0971	0.0807	0.1140	0.0899	-0.0780	0.0678	-0.1060	-0.0014
55	0.1107	0.1217	0.0817	-0.0609	-0.2469	0.0274	-0.1298	0.0250
56	0.0365	-0.2670	-0.0673	0.0063	-0.2175	-0.1900	-0.3090	-0.0971
57	-0.0124	0.0319	-0.0166	-0.0701	0.0260	0.2012	0.0153	0.0733
58	-0.1620	0.0512	-0.2168	-0.1058	-0.0802	-0.2665	-0.1595	-0.1776
59	-0.1726	-0.0222	-0.1397	-0.1477	[illegible]	-0.2751	-0.1417	-0.2081
60	0.0765	0.1400	-0.0233	-0.1190	-0.1887	0.0144	-0.0743	-0.0760
61	-0.0403	0.0177	-0.0019	-0.1567	0.0685	-0.1587	-0.0437	0.0514
62	-0.0431	-0.0924	0.0527	-0.0397	0.1272	0.0361	0.0754	0.0596
63	-0.0669	-0.1618	0.0855	-0.0325	-0.1128	0.1756	0.1961	0.2008
64	-0.1217	-0.0647	-0.1530	-0.0235	-0.0329	-0.1161	0.0284	0.1341
65	0.0528	0.1167	-0.0464	0.1848	0.1637	-0.0707	0.0012	-0.0230
66	0.0114	-0.0238	0.1084	0.1728	0.0474	-0.1249	-0.1603	0.0700
67	-0.0701	0.0335	-0.1495	0.0295	-0.0562	0.1203	-0.0872	0.0246
68	0.0131	0.2090	0.0272	-0.0391	-0.1887	0.1235	0.1624	0.2344
69	0.1699	0.0486	0.2738	0.0912	-0.0194	-0.0029	-0.0222	0.0148
70	0.0150	-0.1655	-0.0790	-0.1098	-0.0563	0.0352	-0.0437	-0.1127
71	0.0327	-0.1530	0.0085	0.0049	-0.1036	0.1079	0.0116	0.1149
72	0.1121	0.0630	0.0422	-0.0662	0.1396	0.2601	0.2342	0.1079
73	0.2000	0.0777	-0.0192	-0.0906	0.0195	0.1661	0.0102	-0.1255
74	-0.0894	-0.1196	-0.0573	-0.1350	0.0047	-0.1238	-0.0859	0.0441
75	-0.0265	-0.0949	0.0049	0.0843	-0.0008	-0.1011	-0.1015	-0.1670
76	0.1694	0.0454	-0.0786	0.0293	0.0454	0.0437	-0.0240	0.0205
77	0.0515	0.2311	0.0475	-0.0671	-0.0275	0.0240	0.0932	-0.0556
78	0.0925	-0.0899	-0.1766	-0.0026	-0.1425	0.1203	-0.0115	-0.0235
79	0.0754	-0.0455	-0.0148	-0.0110	-0.0858	0.1209	-0.1991	0.1209
80	0.1690	0.0367	-0.0192	0.0815	0.0081	0.1061	0.0157	0.0359
81	0.1618	0.0549	0.0240	-0.1148	0.0564	0.1741	0.1309	-0.0817
82	0.0668	-0.0702	-0.1946	0.0934	0.1786	-0.0844	-0.0092	-0.0555
83	0.0743	-0.0030	-0.1334	0.1540	0.2116	-0.1040	-0.0353	-0.1019
84	0.1017	-0.0066	0.0071	0.1765	0.2716	0.1015	0.1377	0.0450
85	-0.0709	-0.1564	-0.0949	-0.0578	-0.0801	0.0399	-0.1564	[illegible]
86	-0.0806	-0.1635	-0.2115	0.1625	0.0733	-0.0614	-0.0584	-0.0181
87	-0.0166	-0.0824	-0.1484	0.0792	0.0014	0.0221	0.0430	-0.0730
88	0.0001	-0.0629	-0.0926	-0.0976	-0.0751	0.0400	0.0938	-0.1571
89	0.1521	0.1176	0.1438	-0.0852	0.0502	0.0627	0.2116	0.0459
90	0.1441	-0.0356	0.1059	0.0353	-0.0757	0.1655	0.2315	-0.0616
91	0.2549	0.2005	0.2289	-0.0475	0.0937	0.2729	0.2130	-0.0674
92	0.1610	0.0081	-0.0155	0.0265	0.2050	0.1324	0.1557	-0.0597
93	0.0603	0.1073	0.0415	-0.0319	0.1040	0.1473	0.1191	-0.0127
94	0.0774	0.1011	-0.0776	-0.0328	-0.0362	0.1334	0.1744	-0.0048
95	0.0603	0.1073	-0.0271	-0.0710	0.0514	0.0945	0.2666	-0.0518
96	0.2545	0.1334	0.0866	0.0528	0.1696	0.1570	0.2487	0.0726
97	-0.0077	-0.0078	-0.0090	-0.0190	-0.0571	0.2220	0.1302	-0.0076
98	0.1244	0.0901	0.0395	-0.0070	0.1740	-0.0811	-0.1507	-0.0025
99	-0.0093	-0.0277	-0.1101	-0.0444	-0.0756	0.2321	0.0901	0.0654
100	0.0886	0.0336	0.0968	0.0470	0.1529	0.2095	0.1472	0.1390
101	0.0496	0.0557	0.0324	0.0864	0.2159	0.0362	0.2647	0.0115
102	0.1371	-0.0130	0.1017	-0.0866	-0.1547	0.1836	0.1747	0.1560
103	0.2608	0.0768	0.0194	-0.0231	-0.0286	0.3703	0.2719	0.1425
104	0.0495	0.0574	0.0957	-0.0860	0.0839	0.0788	0.1341	-0.0486
105	-0.0560	-0.1356	-0.0062	-0.0197	-0.0170	-0.0109	-0.0481	-0.0561
106	0.1936	0.1381	-0.0106	0.1342	0.4304	0.1434	0.2419	-0.0969
107	0.1725	0.0329	-0.1521	0.1757	0.1843	0.0911	-0.0099	0.0532
108	0.2485	-0.0238	-0.0244	0.0750	0.0489	0.5195	0.3206	0.3751
109	0.0802	0.2297	-0.0562	-0.0762	-0.0162	0.1056	0.2679	0.0040
110	0.1358	-0.0277	-0.0265	-0.0910	0.0466	0.2067	0.1526	0.0155
111	0.0980	0.0114	0.0674	-0.2429	-0.0876	0.1966	0.1297	0.0428
112	0.1804	-0.0541	-0.0298	0.1097	0.0751	0.0459	0.1797	0.0769
113	-0.2510	-0.1244	-0.1026	0.0040	0.0089	0.0711	0.0797	0.0073
114	0.1678	0.0198	0.0468	-0.0197	-0.0170	-0.1331	-0.1901	0.0042
115	0.0054	0.1240	0.1678	-0.1949	-0.1461	-0.1802	-0.0749	-0.0570
116	0.2080	0.0414	-0.0650	0.1930	0.1392	0.2377	0.2112	0.0607
117	-0.0431	0.0481	0.1887	0.1954	0.3611	0.0472	-0.0036	-0.0267
118	0.2550	0.0467	0.1684	0.0761	0.1397	0.2217	0.1699	0.1077
119	0.1141	0.0654	0.2072	0.1759	0.2946	0.2103	0.0817	0.0528
120	0.1847	0.0130	0.3221	0.0703	0.1911	0.0622	0.1705	-0.0289
121	0.2669	0.1816	0.1749	0.0670	0.1558	0.0984	0.2331	0.0702

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 122     0.0810       0.0096       0.0135       0.1380       0.2092       0.1170       0.1731      -0.0216
 123     0.2020       0.0748       0.1976       0.1054       0.2134       0.1056       0.2193       0.0057
 124     0.1026      -0.0410       0.1589       0.1932       0.1887       0.1023      -0.0449      -0.0324
       ----------------------------------------------------------------------------------------------------
         COL.         COL.         COL.         COL.         COL.         COL.         COL.         COL.
 ROW     17           18           19           20           21           22           23           24
 ------------------------------------------------------------------------------------------------------------

   1     0.0783      -0.1623      -0.1455       0.0490       0.1056       0.0447      -0.1972       0.4173
   2    -0.0067      -0.1575      -0.1646       0.1408      -0.0694       0.0233       0.0643       0.2154
   3    -0.1001      -0.0564      -0.0855      -0.0456      -0.1648       0.0125       0.1113      -0.2415
   4    -0.0046       0.1161       0.1167       0.0335       0.0269       0.0330       0.0560      -0.2243
   5    -0.0045      -0.1076      -0.0978       0.1995       0.0297      -0.0968      -0.2294       0.3605
   6     0.1600       0.0760       0.0848      [illegible]   0.0617       0.1671      -0.0850       0.2203
   7     0.0605       0.0213       0.0217      -0.0082       0.0594       0.1416      -0.1209       0.1434
   8     0.1333       0.0275       0.0198      -0.1656      -0.0347       0.2234       0.0567      -0.0144
   9     0.1363       0.0116       0.0954      -0.0137      -0.1160       0.2965       0.0158      -0.0113
  10     0.1964      -0.0354      -0.0419      -0.2327      -0.0393       0.2587       0.1443      -0.0056
  11    -0.1277      -0.0544      -0.0429       0.0125      -0.1561       0.0818      -0.0332      -0.1432
  12     0.1163      -0.0024      -0.0269      -0.0924      -0.1241       0.0098      -0.0005      -0.1051
  13     0.1870      -0.1575      -0.1725      -0.2655       0.0661       0.0590      -0.0581      -0.0127
  14    -0.0417       0.0528       0.0830       0.1021      -0.0714       0.2062       0.0564      -0.0312
  15     0.0903      -0.0572      -0.0560      -0.0065      -0.0052       0.2752      -0.0360       0.0428
  16     0.0720      -0.1751      -0.1659      -0.0301      -0.1042       0.4164       0.1104       0.0761
  17     1.0000       0.0031       0.0003      -0.2095      -0.0921       0.1434       0.0195       0.0430
  18     0.0031       1.0000       0.9820       0.1260       0.1093      -0.1292      -0.0278      -0.2143
  19     0.0003       0.9820       1.0000       0.1236       0.1028      -0.1530      -0.0515      -0.2105
  20    -0.2095       0.1260       0.1236       1.0000       0.1507      -0.0143      -0.1558       0.0779
  21    -0.0921       0.1093       0.1028       0.1507       1.0000      -0.1521      -0.0421       0.1284
  22     0.1434      -0.1292      -0.1530      -0.0843      -0.1521       1.0000       0.2371       0.1300
  23     0.0195      -0.0278      -0.0515      -0.1518      -0.0421       0.2371       1.0000      -0.0657
  24     0.0430      -0.2143      -0.2105       0.0779       0.1284       0.1300      -0.0657       1.0000
  25    -0.0886      -0.1141      -0.1061      -0.0586      -0.0872       0.0268       0.1252      -0.0445
  26     0.0737      -0.0128      -0.0476      -0.0726      -0.0843      -0.0394       0.0411       0.0030
  27     0.0417      -0.1234      -0.1143      -0.0849      -0.1016       0.0003      -0.0209       0.1485
  28     0.0876      -0.1330      -0.1281      -0.0555      -0.0012      -0.0630      -0.0226      -0.0075
  29     0.0556      -0.0629      -0.0700       0.0903      -0.0503      -0.0027       0.0749       0.0015
  30     0.0345      -0.1172      -0.1230       0.0348      -0.0545      -0.0299       0.1119       0.0217
  31    -0.0603      -0.1125      -0.1031       0.0860      -0.0578      -0.0143       0.0946      -0.0097
  32     0.1280      -0.0198      -0.0081      -0.2410       0.0578      -0.0241      -0.1357       0.0317
  33    -0.0762       0.0276       0.0141       0.2050      -0.0655       0.0976       0.1078      -0.0778
  34    -0.1135       0.0421       0.0444      -0.0225       0.0206      -0.1356       0.0222       0.0564
  35     0.5369       0.0604       0.0747      -0.2562       0.0269       0.0158       0.0492      -0.0091
  36     0.4837       0.0095       0.0398      -0.2217       0.0197       0.0646       0.0145       0.0654
  37     0.0744       0.0305       0.0362      -0.0394       0.0362      -0.1430      -0.0169      -0.0166
  38     0.4834       0.0461       0.0746      -0.2511       0.0005       0.0042      -0.0178       0.0669
  39     0.1041       0.0206       0.0272      -0.1234       0.0629       0.1028      -0.0524       0.0260
  40    -0.1544       0.1015       0.0937       0.0810       0.0665      -0.1327      -0.1403       0.1060
  41     0.0402      -0.0425      -0.0402      -0.0526      -0.0454      -0.0532       0.2067      -0.1031
  42     0.0395      -0.0757      -0.0954       0.0137      -0.0729      -0.0016       0.1433      -0.2025
  43    -0.2045      -0.0585      -0.0742       0.0201      -0.0946      -0.1474       0.2275      -0.0613
  44     0.2591       0.0474       0.0701      -0.0100      -0.1229       0.0776      -0.0161      -0.0983
  45     0.3984      -0.0662      -0.0519      -0.1641       0.0071       0.1884       0.1371      -0.2059
  46    -0.1561      -0.0044      -0.0025       0.0369       0.0809      -0.0285      -0.0335       0.0957
  47     0.0890       0.0592       0.0404      -0.1783       0.0631       0.0150       0.2612      -0.0915
  48     0.1251      -0.1647      -0.1495      -0.0350      -0.7058       0.0945       0.0413      -0.1107
  49     0.1113      -0.0069      -0.0367       0.0915      -0.0592       0.0755      -0.0480       0.1216
  50    -0.0077      -0.1483      -0.1460       0.0434       0.1118       0.0701       0.0466      -0.0597
  51     0.0424       0.0656       0.0701       0.0530       0.0373       0.0820       0.1476       0.0637
  52    -0.0373       0.0213      -0.0140       0.0820       0.0503      -0.1031       0.1397      -0.1013
  53    -0.0134       0.0674       0.0775       0.0243      -0.0171      -0.0780      -0.0612      -0.0031
  54     0.3111       0.1036       0.1055      -0.0058       0.0309       0.0131       0.0333      -0.0963
  55     0.0453       0.0997       0.1042      -0.0591       0.0440      -0.0319      -0.0473      -0.0571
  56    -0.0428       0.1839       0.1854       0.0454       0.0452      -0.2030      -0.2033      -0.1062
  57    -0.0684      -0.0949      -0.0915      -0.0133      -0.0013      -0.0896       0.0228      -0.0594
  58    -0.0987       0.1131       0.1167       0.0237       0.0396       0.0706      -0.0779       0.2156
  59    -0.2093       0.0880       0.1047       0.1075       0.1057      -0.1857      -0.2372       0.1149
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O.C.

60	0.0204	0.0486	0.0639	0.1665	0.0905	-0.0436	-0.0371	0.0100
61	-0.0888	-0.0767	-0.0595	0.0609	0.0752	-0.0586	0.0403	0.0344
62	-0.1949	-0.1499	-0.1341	0.0927	-0.0476	-0.0766	-0.1009	0.2114
63	-0.1922	-0.0236	-0.0115	0.2532	0.0286	0.1150	-0.0596	0.1992
64	0.0622	-0.1542	-0.1311	0.0910	0.0900	0.1739	-0.0194	0.3221
65	0.1783	0.1127	0.0966	-0.2513	0.0188	-0.2149	0.0249	-0.2537
66	0.0736	0.0953	0.1063	-0.0124	-0.0282	0.0181	-0.0458	0.0271
67	-0.0313	0.1379	0.1227	0.0393	0.0715	0.0875	-0.0017	0.0560
68	-0.0623	-0.0741	-0.0374	-0.1265	-0.0146	0.0094	0.2658	-0.0731
69	0.1145	-0.0926	-0.1071	-0.2038	-0.1626	-0.0511	0.0773	-0.0267
70	-0.1557	0.2459	0.2302	0.2040	0.1220	0.0488	-0.1592	-0.0731
71	0.0421	0.0848	0.0920	0.1169	0.0555	-0.0842	0.1104	-0.0723
72	-0.0505	0.1933	0.1894	0.0750	0.0191	-0.0723	0.0884	-0.1505
73	0.0491	0.2417	0.2846	0.0136	0.0232	-0.0233	0.0233	-0.1246
74	0.1660	0.0263	0.0346	0.0233	0.1438	-0.1322	-0.1035	-0.1122
75	0.0656	0.1451	0.1455	-0.0761	0.1322	-0.1403	-0.0945	0.0117
76	0.1761	0.2457	0.2418	0.0599	0.0318	0.0804	0.0343	[illegible]
77	-0.0267	0.1462	0.1264	0.0060	-0.0745	0.1642	0.1355	0.0149
78	-0.0980	0.2107	0.2162	0.0728	-0.0515	0.0597	-0.0667	-0.0106
79	-0.0550	-0.0058	0.0025	0.0300	-0.2365	0.0399	0.1367	-0.0257
80	0.0321	0.2459	0.2450	0.1370	0.0637	-0.0328	-0.1192	-0.0367
81	0.0191	0.1822	0.1782	-0.0949	0.0164	-0.1079	0.0598	-0.0516
82	0.0112	0.1164	0.1071	0.1604	0.1014	-0.1811	-0.1180	0.0160
83	0.0447	0.1095	0.1015	0.0475	-0.0199	-0.2134	-0.0874	0.0025
84	0.1581	0.0717	0.0774	0.0465	0.0467	0.0517	-0.0666	[illegible]
85	0.0146	0.0631	0.0569	0.0706	-0.1401	-0.1442	-0.2367	-0.0473
86	0.2000	0.1016	0.0694	0.1574	0.0765	-0.1985	-0.1640	0.0672
87	0.1572	0.0654	0.0458	0.1626	-0.0804	-0.0792	-0.1711	0.0645
88	0.0589	0.1045	0.0699	0.1684	0.0670	-0.0793	-0.1135	0.1723
89	-0.0139	0.0126	0.0374	-0.0933	-0.0657	-0.0259	0.1349	-0.1244
90	-0.0284	0.1067	0.1153	0.1744	0.0723	-0.0625	-0.0489	-0.1230
91	0.0933	0.1371	0.1470	-0.0875	-0.1227	0.0246	-0.1027	[illegible]
92	0.1396	0.0591	0.0578	-0.1157	-0.1014	0.0647	0.1294	-0.1591
93	0.2233	0.0220	0.0154	-0.2147	-0.0279	0.1154	0.0535	0.1229
94	0.0591	-0.0678	-0.0714	0.0794	-0.0232	0.0744	-0.1129	-0.0674
95	-0.0062	-0.0464	-0.0980	-0.0513	-0.0274	0.0474	-0.1755	-0.0341
96	-0.0048	-0.0576	-0.0728	0.1003	0.1278	0.0565	-0.1164	0.0281
97	0.0554	0.0413	0.0772	0.1590	-0.0523	-0.0527	-0.1654	-0.0469
98	0.1032	-0.0671	-0.0594	-0.2819	0.0269	0.0320	0.0965	-0.2594
99	0.0457	0.0066	0.0725	-0.0881	-0.0083	0.0545	0.0015	-0.0417
100	-0.0304	0.0549	0.0252	0.0112	-0.0442	0.1675	0.0786	[illegible]
101	-0.0648	-0.0175	-0.0384	0.0547	-0.1136	0.0578	-0.0655	0.0794
102	-0.0045	0.2351	0.2253	0.0957	-0.0039	0.2539	0.1033	0.1163
103	0.0166	0.0281	0.0264	0.0741	-0.0030	0.3144	-0.0335	0.1307
104	-0.0423	-0.0516	-0.0575	0.1475	-0.0149	0.1710	0.0587	0.0865
105	-0.1436	-0.1953	-0.0869	0.1071	-0.1561	0.2393	-0.0738	0.0139
106	-0.0811	0.1209	0.1452	-0.1358	0.1523	0.1060	-0.1015	-0.0419
107	0.0240	0.0621	0.0746	0.0247	-0.0227	0.2224	-0.0812	0.0420
108	-0.0181	0.2019	0.1879	0.1396	-0.0324	0.3228	0.1504	0.0487
109	-0.0532	-0.1871	-0.2449	-0.0481	-0.1484	0.1277	0.1029	-0.0035
110	-0.0650	-0.0634	-0.0630	-0.0395	-0.0083	0.0545	0.0326	-0.0160
111	0.0224	-0.2055	-0.1594	0.1159	-0.0454	0.1374	-0.0986	0.0546
112	0.0247	-0.1114	-0.0803	0.0604	0.1409	-0.0615	-0.0434	-0.0202
113	-0.0093	-0.0096	-0.0329	0.0763	0.0943	0.0757	-0.0835	-0.0723
114	-0.1436	-0.0138	0.0010	-0.0821	-0.1561	-0.1292	0.0475	-0.0733
115	-0.0489	0.0757	0.0795	0.1044	0.0371	-0.0024	0.0090	-0.0211
116	0.2935	-0.0745	-0.0249	-0.0502	0.0437	0.0677	0.0471	0.1301
117	0.1864	-0.0463	-0.0965	-0.1620	-0.0262	-0.0014	0.2539	-0.0049
118	0.1405	-0.0038	-0.0040	0.1548	-0.0545	0.2628	0.1567	0.0349
119	0.1554	-0.0616	-0.0682	-0.0130	-0.0473	0.1529	0.2709	0.0170
120	-0.0440	0.0988	0.1044	0.1280	-0.0113	-0.0152	0.0232	0.0271
121	0.0126	0.1762	0.1714	0.1353	-0.0559	0.1557	-0.0257	0.0266
122	0.1849	0.2206	0.2260	-0.0316	-0.0224	-0.0174	0.0606	0.0653
123	0.0571	0.1863	0.1908	0.0894	-0.0334	0.0438	0.0233	0.0544
124	0.0042	0.1271	0.1156	0.0617	-0.0500	-0.0136	0.1565	-0.0040

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	Col. 25	Col. 26	Col. 27	Col. 28	Col. 29	Col. 30	Col. 31	Col. 32
1	-0.0109	0.0115	-0.0395	0.0392	-0.1097	-0.1265	-0.0899	0.0476
2	-0.0272	-0.0657	-0.0202	-0.0072	-0.0723	-0.1301	-0.0427	0.0313
3	-0.0089	0.1356	0.0208	0.0561	-0.0381	0.0362	-0.0032	0.1377
4	0.1467	0.0547	-0.0371	0.0506	0.0360	-0.0403	0.0552	0.1072
5	0.1312	0.1705	0.2153	0.2267	0.0907	0.0967	0.0750	0.1543
6	0.1367	0.2157	0.1650	0.1105	0.0645	-0.0518	-0.0755	[illegible]
7	0.1353	0.1921	0.1379	0.0915	-0.0056	-0.0569	-0.0576	0.0651
8	0.0240	0.0456	0.0986	-0.0036	-0.0528	-0.0279	-0.0463	0.0741
9	-0.0455	0.0900	0.1560	0.0411	0.0405	0.0307	0.0125	0.0340
10	0.0888	0.1659	0.1856	0.0657	0.0054	0.0267	0.0039	0.0155
11	0.0777	0.1715	0.0444	0.0794	0.1442	0.1841	0.1547	0.0427
12	0.0451	0.0079	0.0137	0.0139	-0.0434	-0.0749	-0.1616	0.0527
13	0.1594	0.2261	0.1916	0.1523	0.1004	0.1004	0.0437	0.2156
14	0.0273	0.0375	0.1520	0.0661	0.0448	0.0815	0.0791	-0.0174
15	-0.0647	0.0160	0.1190	-0.0005	0.0842	0.0630	0.0411	0.0253
16	0.0983	-0.0516	0.0080	0.0436	0.0617	0.0808	0.1026	-0.1014
17	-0.0556	0.0737	0.0417	0.0876	0.0556	0.0245	-0.0503	0.1280
18	-0.1141	-0.0524	-0.1234	-0.1330	-0.0629	-0.1172	-0.1126	-0.0194
19	-0.1081	-0.0476	-0.1193	-0.1281	-0.0700	-0.1230	-0.1031	-0.0011
20	-0.0586	-0.0729	-0.0899	-0.0555	0.0903	0.0348	0.0860	-0.2410
21	-0.0822	-0.0645	-0.1016	-0.0012	-0.0503	-0.0545	-0.0378	0.0575
22	0.0266	-0.0393	0.0003	-0.0630	-0.0027	-0.0706	-0.0593	-0.0241
23	0.1252	0.0411	-0.0209	-0.0226	0.0760	0.1119	0.0448	-0.1367
24	-0.0442	0.0030	0.0965	-0.0025	0.0095	0.0317	-0.0097	0.0987
25	1.0000	0.4543	0.3982	0.4399	0.5168	0.4587	0.4715	0.1692
26	0.4443	1.0000	0.7185	0.7702	0.4236	0.3641	0.3474	0.0767
27	0.3982	0.7185	1.0000	0.7185	0.3636	0.4303	0.3757	0.0676
28	0.4299	0.7762	0.7185	1.0000	0.4680	0.4490	0.5413	0.1135
29	0.5144	0.4276	0.7636	0.4660	1.0000	0.9007	0.8100	0.1126
30	0.4567	0.3641	0.4303	0.4550	0.9007	1.0000	0.9456	0.1744
31	0.4715	0.3574	0.3757	0.5413	0.3149	0.9456	1.0000	0.0678
32	0.1693	0.0757	0.0676	0.1124	0.1129	0.1744	0.0878	1.0000
33	0.0641	0.0112	-0.0191	-0.1070	-0.0079	-0.1071	-0.0363	-0.0813
34	-0.2795	-0.2053	-0.1058	-0.0583	-0.1647	-0.1476	-0.0956	-0.1012
35	-0.0586	-0.0596	-0.0529	-0.0445	-0.0170	-0.0218	-0.2234	0.0556
36	-0.1185	0.0161	0.0692	0.0269	-0.0426	-0.0490	-0.1439	0.1661
37	-0.0581	[illegible]	-0.0243	-0.0518	-0.1166	-0.0243	-0.0166	0.2344
38	-0.0107	-0.0871	-0.0903	-0.0875	-0.0266	-0.0468	-0.1914	0.2549
39	0.1346	0.2004	0.1150	0.1679	0.0695	0.0969	0.0798	0.3776
40	-0.0554	0.0151	0.1267	-0.1467	0.1918	0.2423	0.1301	0.0763
41	0.2093	0.1166	0.0439	0.0947	0.0454	0.1281	0.0709	0.0516
42	0.2567	0.0488	-0.0212	0.0372	0.0595	0.0962	0.0554	0.2013
43	0.2431	0.1405	0.0231	0.0755	0.0308	0.0462	0.0425	0.1447
44	0.1447	0.0416	0.0717	0.0444	0.0513	0.0043	0.0246	0.3304
45	0.1040	0.0208	-0.0340	0.0186	0.0394	0.0461	-0.0739	0.3111
46	-0.1057	-0.0743	-0.0713	-0.0253	-0.1590	-0.1079	-0.0833	[illegible]
47	-0.0182	-0.0650	-0.0402	-0.0246	0.0550	0.0954	0.0423	0.0275
48	0.1467	0.0689	0.0459	0.0997	0.0760	0.1246	0.1529	-0.0564
49	0.0513	0.0973	0.0316	0.1367	0.0301	0.0869	0.1167	0.0097
50	0.1174	0.0814	-0.1020	0.0651	-0.0257	0.0202	-0.0133	0.1127
51	0.1312	0.0278	-0.0514	0.0038	-0.1423	-0.1415	-0.0571	-0.0173
52	0.1922	0.1375	0.0821	0.1247	0.2351	0.1436	0.1657	0.0326
53	-0.1794	-0.3543	-0.2575	-0.2429	-0.0874	-0.0716	-0.0420	0.1055
54	0.0073	0.1131	-0.0374	0.1791	0.2093	0.1068	0.1407	-0.0658
55	-0.0654	0.1947	0.1009	0.1838	0.0263	-0.0156	0.1216	-0.0791
56	-0.2689	-0.2420	-0.2490	-0.1959	-0.1335	-0.1432	-0.1196	-0.0715
57	0.0578	-0.0197	0.0310	-0.0224	-0.0700	0.0376	0.0747	0.1176
58	-0.0136	0.0498	0.0431	0.0041	-0.0288	-0.0912	-0.0351	-0.1737
59	-0.0397	0.0561	0.0110	-0.0102	-0.0197	-0.1018	-0.0676	-0.1759
60	-0.0104	0.2250	0.1444	0.1975	-0.0186	-0.0693	-0.0415	0.0270
61	-0.1069	-0.0875	-0.1139	-0.1184	-0.0223	-0.0409	-0.0381	-0.0683
62	0.0609	0.0763	0.0246	0.0560	0.1467	0.1175	0.1071	0.1047
63	0.0475	0.1165	0.0516	0.0301	-0.0128	-0.0289	0.0293	-0.0830
64	-0.0419	-0.0417	-0.1044	-0.1381	-0.0505	-0.0964	-0.1217	-0.0179
65	-0.2013	0.1506	0.0760	0.1267	-0.0785	-0.0712	-0.0556	-0.1130

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     66    0.0013     0.0183    -0.0697     0.0733    -0.0124    -0.0649    -0.1035    -0.0251
     67   -0.1393    -0.0874    -0.0389     0.0200    -0.1676    -0.1727    -0.1300     0.0303
     68    0.2951    -0.1833     0.1734     0.1077     0.0943     0.0355     0.0488    -0.0779
O.C. 69    0.2418     0.2081     0.0794     0.1659     0.1739     0.1603     0.2026     0.2649
     70   -0.1943    -0.2125    -0.2211    -0.2952    -0.2080    -0.2069    -0.1535    -0.0259
     71   -0.0657    -0.1926    -0.0541    -0.0539    -0.0472     0.0252    -0.0043    -0.0109
     72    0.0073     0.1134     0.1420     0.1469     0.1418     0.1510     0.1522    -0.0231
     73    0.0089     0.1096     0.0345     0.1200     0.0750     0.0059     0.0191    -0.1140
     74    0.0492    -0.0313    -0.1136     0.0440     0.0175    -0.0487     0.0147    -0.0474
     75   -0.0500    -0.0948    -0.1973    -0.2161    -0.0547    -0.0422    -0.0400    -0.0776
     76    0.0752     0.0828     0.0270     0.1162     0.1050     0.0336     0.0956    -0.1563
     77    0.0534     0.0709     0.0463     0.0493     0.0688     0.0780     0.0663     0.1374
     78    0.0038    -0.0262     0.0328    -0.0150    -0.1466    -0.1179    -0.1095    -0.0550
     79    0.0696     0.1077     0.1900     0.1910     0.0848     0.0710     0.1489    -0.2065
     80   -0.0991    -0.1094    -0.0909    -0.0578    -0.1232    -0.1396    -0.0951     0.0574
     81   -0.0623     0.0052     0.0649     0.1471     0.0219     0.0360     0.1276    -0.0505
     82    0.0370     0.0719     0.2078     0.1947     0.1066     0.1290     0.1160     0.0556
     83   -0.0538     0.0466     0.0445     0.0567     0.1262     0.1278     0.1238     0.0465
     84    0.2172     0.2135     0.1199     0.2055     0.2519     0.2350     0.1686     0.1166
     85   -0.0075    -0.0926    -0.1343    -0.0269     0.0029    -0.0050     0.0241     0.0552
     86   -0.0677     0.0428     0.0105     0.1788     0.0525     0.0119     0.0487     0.0754
     87   -0.1022     0.0455    -0.0018     0.0722    -0.0959    -0.0446    -0.0050     0.1354
     88   -0.0480     0.1507     0.2218     0.2218    -0.0241     0.0764     0.0638     0.0570
     89    0.0109    -0.0069    -0.0367    -0.0691    -0.0048    -0.0526    -0.0203     0.0497
     90   -0.1075     0.0024     0.0009     0.0288     0.0256    -0.0344    -0.0245    -0.0572
     91    0.0516     0.0498     0.0628    -0.0336    -0.0214     0.0287     0.0393     0.1850
     92   -0.1318    -0.0034    -0.0447     0.1179    -0.0420    -0.0258     0.0896     0.1337
     93   -0.1411    -0.0208     0.0210    -0.0339    -0.1193    -0.1035    -0.1121    -0.0150
     94   -0.0046     0.0463     0.0827    -0.0034    -0.0606    -0.0972    -0.1367     0.0510
     95    0.0200     0.1254     0.0792     0.0280    -0.0680    -0.1025    -0.0571     0.1369
     96   -0.0719    -0.1762    -0.1122    -0.1908     0.0013    -0.0346    -0.0677     0.2246
     97   -0.0967     0.0728     0.0090    -0.0311    -0.0740    -0.0641    -0.0488     0.0620
     98   -0.0503    -0.0378    -0.1271     0.0506    -0.1227    -0.0403    -0.0220     0.2290
     99   -0.0260    -0.0239     0.0322    -0.0009    -0.0355    -0.0702    -0.1299     0.0407
    100    0.2505     0.1157     0.1716     0.0514     0.1827     0.1097     0.1672     0.1469
    101    0.0036     0.0505     0.0723     0.1002     0.0156    -0.0427     0.0204     0.2212
    102    0.0924    -0.1212    -0.0988    -0.0696     0.0987     0.1015     0.0647    -0.0675
    103   -0.0909     0.0042     0.1000     0.0533     0.0983     0.0756     0.0069     0.0520
    104    0.1545     0.1487     0.0692     0.0647     0.1285     0.1024     0.0603    -0.0096
    105    0.0289     0.0102    -0.0230    -0.0161    -0.0630    -0.1252    -0.0630    -0.0769
    106   -0.0796    -0.0255     0.0013    -0.0759     0.0247    -0.0064     0.0455     0.2849
    107   -0.1002     0.0963    -0.0066    -0.0023     0.0977     0.0797    -0.0031     0.1115
    108   -0.0907    -0.0307    -0.0095    -0.0034     0.0132     0.0306     0.0096     0.0285
    109   -0.0908    -0.0341    -0.0005     0.0074     0.0429     0.0182     0.0598    -0.0675
    110   -0.0260    -0.0234     0.0648     0.0359    -0.0965    -0.0702    -0.0111     0.1329
    111   -0.0112    -0.0824    -0.0369    -0.1052     0.0950     0.1157     0.1629    -0.0623
    112   -0.2014     0.0270     0.1282     0.0377    -0.0116     0.0520     0.0196    -0.1119
    113   -0.0293    -0.0223    -0.1061    -0.0506     0.0658     0.0265     0.0435     0.1033
    114    0.0087     0.0137     0.1343     0.0316     0.0452     0.1017     0.0419    -0.0709
    115    0.1955     0.1247    -0.0580     0.0769    -0.0233    -0.1123     0.0051    -0.0605
    116   -0.1434    -0.0920     0.0127     0.0045    -0.1346    -0.0765    -0.1503     0.0282
    117    0.3542     0.2612     0.2670     0.2113     0.1268     0.2121     0.1003     0.3620
    118    0.1605     0.1231     0.1937     0.2332     0.1003     0.1416     0.1313     0.0907
    119    0.3130     0.2404     0.2375     0.2562     0.1432     0.2076     0.1317     0.2679
    120    0.4372     0.2024     0.0350     0.1063     0.3436     0.2365     0.2527     0.1151
    121    0.2494     0.1544     0.1134     0.0839     0.2638     0.1277     0.1007     0.1365
    122    0.1662     0.0155    -0.0188    -0.0740     0.1530     0.0726     0.0241     0.0774
    123    0.3293     0.1423     0.0480     0.0453     0.2921     0.1694     0.1470     0.1266
    124    0.2666     0.2332     0.1767     0.2318     0.1864     0.1646     0.1289     0.1777

           COL.       COL.       COL.       COL.       COL.       COL.       COL.       COL.
           33         34         35         36         37         38         39         40
    ROW

      1   -0.0885     0.0190     0.0434     0.1068     0.1076     0.0489     0.1573    -0.4290
      2   -0.0397    -0.0179    -0.1368    -0.0638     0.0440    -0.0161    -0.0152    -0.0582
      3   -0.0599    -0.1252    -0.1196    -0.0784     0.1995    -0.0865    -0.0771     0.0069
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O.C.

4	-0.0744	-0.0472	0.0094	0.0325	0.0542	-0.0047	0.1059	-0.3308
5	-0.1439	-0.0521	-0.0730	-0.0765	0.0849	-0.0548	0.0907	0.0691
6	0.0377	-0.1081	-0.0187	0.0148	0.0045	-0.0124	0.1558	0.0731
7	-0.0035	-0.1041	-0.0570	-0.0340	0.0215	-0.0317	0.1550	0.0955
8	0.0778	-0.1573	0.0747	0.0687	0.0185	0.0543	0.1331	-0.0115
9	0.0264	-0.0270	0.0445	0.0996	-0.1177	0.0872	0.0149	0.0435
10	0.1086	-0.1287	0.1230	0.1227	-0.0591	0.0735	0.1071	-0.0529
11	-0.0287	0.0031	-0.0814	-0.0617	-0.0264	-0.0230	0.0313	0.1924
12	0.0171	-0.1598	0.1345	0.0779	0.0140	0.0176	0.0022	-0.0450
13	-0.1910	-0.2195	0.0907	0.1472	0.1749	0.2098	0.3211	0.0479
14	0.0765	-0.1349	-0.1328	-0.0339	-0.1173	-0.0343	0.1084	-0.0308
15	0.0357	-0.0946	0.0601	0.1257	-0.1415	0.1691	0.2104	0.0519
16	0.0579	0.1057	0.0572	-0.0186	-0.2486	-0.0415	0.1862	-0.1051
17	-0.0762	-0.1135	0.5369	0.4837	0.0746	0.4834	0.1051	-0.1544
18	0.0276	0.0471	0.0504	0.0095	0.0305	0.0461	0.0206	0.1015
19	0.0141	0.0444	0.0747	0.0399	0.0362	0.0746	0.0272	0.1627
20	0.2050	-0.0225	-0.2562	-0.2217	-0.0394	-0.2511	-0.1334	0.0710
21	-0.0555	0.0206	0.0269	0.0197	0.0362	0.0005	0.0629	0.0665
22	0.0976	-0.1356	0.0158	0.0544	-0.1430	0.0042	0.1028	-0.1327
23	0.1078	0.0222	0.0092	0.0145	-0.0168	-0.0178	-0.0524	-0.1404
24	-0.0776	0.0264	-0.0043	0.0534	-0.1156	0.0609	0.0260	0.1060
25	0.0031	-0.2795	-0.0656	-0.1185	-0.0531	-0.2107	0.1546	-0.0554
26	0.0197	-0.2053	-0.0596	0.0163	0.0211	-0.0871	0.2004	0.0151
27	-0.0191	-0.1048	-0.0529	0.0092	-0.0243	-0.0062	0.1150	0.1262
28	-0.1078	-0.0385	-0.0445	0.0268	-0.0518	-0.0878	0.1675	-0.0467
29	-0.0078	-0.1647	-0.0170	-0.0426	-0.1166	-0.0264	0.2585	0.1518
30	-0.1071	-0.1678	-0.0218	-0.0490	0.0343	-0.0468	0.0960	0.2423
31	-0.0363	-0.0956	-0.2234	-0.1938	-0.0166	-0.1914	0.0709	0.1391
32	-0.1813	-0.1012	0.0858	0.1661	0.2244	0.2549	0.3276	0.0765
33	1.0000	-0.3146	-0.0709	-0.1349	-0.2187	-0.2327	-0.2356	-0.0073
34	-0.3146	1.0000	-0.0760	-0.1295	-0.0634	-0.0380	-0.2764	-0.1471
35	-0.0709	-0.0760	1.0000	0.8525	0.0991	0.7569	0.1420	-0.0365
36	-0.1349	-0.1295	0.8525	1.0000	0.0572	0.8927	0.2621	-0.0869
37	-0.2187	-0.0634	0.0991	0.0572	1.0000	0.0358	0.0128	-0.0960
38	-0.2327	-0.0380	0.7569	0.8927	0.0358	1.0000	0.2739	0.0314
39	-0.2356	-0.2764	0.1420	0.2621	0.0128	0.2739	1.0000	-0.0436
40	-0.0073	-0.1471	-0.0365	-0.0869	-0.0960	0.0304	-0.0436	1.0000
41	-0.1624	-0.1706	-0.0399	-0.1044	0.0606	-0.0184	-0.0207	0.2293
42	-0.1023	-0.1257	0.0554	-0.0517	0.1044	0.0656	-0.0285	0.1414
43	-0.1266	-0.0121	-0.3601	-0.3841	0.0851	-0.3206	-0.1807	0.0550
44	-0.2580	-0.1375	0.1904	0.2053	0.1756	0.2431	0.1637	0.0056
45	-0.2042	-0.1424	0.3708	0.3826	0.0428	0.4397	0.1241	-0.0476
46	0.2068	-0.0207	-0.1372	-0.0752	-0.1472	-0.1393	-0.3677	0.1562
47	-0.0136	0.0068	0.1513	-0.0861	0.2043	-0.0690	-0.0475	0.0737
48	0.0041	-0.0321	-0.0699	-0.0532	-0.0728	-0.1019	-0.1469	-0.0265
49	-0.0934	-0.0407	-0.1665	-0.1373	-0.1864	-0.1144	0.0360	0.0506
50	-0.2270	0.0624	-0.1055	-0.0466	0.0199	-0.0560	-0.0798	-0.1219
51	0.0524	-0.0654	-0.1205	-0.1286	-0.0483	-0.1744	-0.1579	0.0539
52	0.0185	-0.0857	-0.2080	-0.2019	-0.0039	-0.1826	-0.1148	0.0248
53	0.0167	-0.1462	0.0328	0.0310	-0.0492	0.0687	0.0509	0.2509
54	0.0997	-0.0642	0.0638	0.0935	-0.2162	0.0734	-0.0214	-0.1047
55	0.0401	0.0113	-0.1286	-0.1434	-0.1397	-0.1342	-0.0435	0.0267
56	-0.0341	0.2861	0.1226	0.0358	0.3385	0.0524	-0.1538	-0.0114
57	-0.0331	-0.1668	0.1316	0.1151	0.0932	0.0051	0.2064	-0.0945
58	0.0439	0.2151	-0.1611	-0.1209	0.0365	-0.2131	-0.0939	-0.1719
59	0.0446	0.2326	-0.0450	0.0126	-0.0835	0.0047	-0.0352	-0.0464
60	-0.0550	0.1987	-0.0302	0.0241	-0.1637	-0.0271	0.0066	-0.0735
61	-0.0644	0.2768	-0.1943	-0.2116	-0.1176	-0.1461	-0.1766	-0.0050
62	-0.1443	0.1418	-0.3767	-0.3651	-0.0131	-0.2520	-0.0077	0.1536
63	0.0549	0.0396	-0.3213	-0.1523	-0.1696	-0.1700	0.2281	-0.0004
64	0.0429	-0.0348	0.0244	-0.1070	-0.0653	-0.0346	0.2544	-0.0080
65	0.1045	-0.0329	0.1740	0.1855	0.1046	0.1405	0.0019	0.0667
66	-0.0294	0.1728	0.0987	0.0849	0.0057	0.0534	-0.1261	-0.0348
67	0.0409	-0.1253	-0.0812	-0.0494	-0.1835	-0.0996	0.0330	0.1224
68	0.1055	-0.0308	0.1347	0.0876	-0.2002	0.0112	0.0710	-0.1734
69	-0.3188	0.0127	-0.0590	-0.1077	0.0204	-0.0413	0.0556	0.0927
70	0.0185	-0.0145	-0.1174	-0.1937	0.0486	-0.1511	-0.1241	0.0847
71	-0.0412	-0.0973	0.1256	0.1878	-0.0681	0.1299	-0.0220	0.0703

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 72    0.0495   -0.0324   -0.0077    0.0188    0.1492    0.0195    0.1836    0.0828
 73    0.1294   -0.0407   -0.0146    0.0089    0.0973   -0.0189    0.0599    0.0394
 74    0.0594    0.0237    0.2144    0.1546   -0.0738    0.0880   -0.1047   -0.0367
 75    0.1281   -0.1150   -0.0373    0.0472    0.1359   -0.0236   -0.0845    0.0979
 76    0.1773   -0.0558   -0.0425   -0.0279    0.0316   -0.1176   -0.0247    0.0076
 77   -0.1475    0.0015   -0.0260    0.0207    0.1050    0.0795    0.2298   -0.0425
 78    0.0111    0.0184   -0.1647   -0.2246    0.0928   -0.2438   -0.0596   -0.0776
 79    0.2246   -0.0738   -0.1695   -0.1765   -0.0471   -0.2001   -0.1206    0.0542
 80   -0.0731   -0.1064   -0.0823   -0.0575    0.1147   -0.0689   -0.0127    0.1967
 81   -0.0453    0.3009   -0.0098   -0.0236    0.1999   -0.0184    0.0909   -0.0707
 82   -0.0651    0.0010   -0.0520   -0.0556    0.0687   -0.0427   -0.0655    0.1147
 83   -0.0187   -0.0761    0.0093    0.0068   -0.0624    0.0516    0.0706    0.1536
 84   -0.0641   -0.1529    0.0696   -0.0196    0.0723    0.0192    0.1013    0.0331
 85   -0.1344    0.1048   -0.1388   -0.1059   -0.0670   -0.0565    0.0455   -0.1264
 86   -0.1150    0.0557    0.0531    0.0339    0.0825    0.0470   -0.0754   -0.0292
 87   -0.1236   -0.0546   -0.0916   -0.0910    0.0626   -0.0021   -0.0190    0.0567
 88   -0.1315    0.0975   -0.0224    0.0701   -0.0901    0.1006    0.0212    0.1065
 89    0.1227   -0.2384    0.0586    0.1543   -0.0543    0.1946    0.1619    0.0171
 90    0.1518   -0.1268    0.0557    0.1206   -0.0753    0.0592    0.0071    0.0173
 91   -0.0937   -0.1407   -0.0006    0.0739    0.1734    0.1310    0.1611   -0.0751
 92   -0.0620   -0.1861    0.1349    0.2563   -0.0074    0.2121    0.0357    0.0663
 93    0.0625   -0.1265    0.1465    0.1702    0.1212    0.2253    0.1912    0.0292
 94    0.0456   -0.3124    0.1709    0.2295    0.1326    0.1760    0.1179    0.0746
 95   -0.0101   -0.3015    0.0673    0.2875    0.0326    0.2442    0.1201   -0.0653
 96   -0.0667   -0.2741    0.0931    0.2111   -0.1070    0.2528    0.1775    0.0118
 97    0.0112   -0.2001    0.1361    0.3107    0.1312    0.2614    0.0920   -0.0595
 98   -0.1867   -0.0472   -0.0076    0.0325    0.0268   -0.0579    0.0841   -0.2515
 99   -0.0462    0.0145    0.1980    0.2321   -0.0589    0.2361   -0.1061   -0.0295
100   -0.1147    0.0776   -0.0569   -0.1364    0.0678   -0.1329    0.0517   -0.0757
101   -0.1596   -0.0546    0.0773    0.1874    0.0027    0.1720    0.2204    0.1074
102    0.0595    0.0681    0.0479    0.0628   -0.1666    0.0002   -0.0971    0.0651
103   -0.0798    0.0055    0.0196    0.1956   -0.1597    0.1023   -0.0630    0.0554
104    0.0723   -0.1614   -0.0437    0.0966   -0.1250    0.0587    0.0121    0.0019
105    0.1395   -0.1321   -0.2953   -0.3041   -0.0127   -0.2872    0.0367    0.0864
106   -0.1732   -0.1373   -0.0678    0.0269    0.1487    0.0566    0.1435    0.1565
107   -0.0475   -0.1501    0.0120    0.0153   -0.0264    0.0545    0.0069    0.1751
108   -0.0581    0.0571    0.0042    0.1400   -0.1710    0.1256    0.1502    0.0751
109    0.1327   -0.1256   -0.1178   -0.0786   -0.0642   -0.0340    0.0297    0.0850
110   -0.1326    0.0145   -0.1252   -0.0936    0.1732    0.0677    0.1078   -0.1043
111    0.1767   -0.2564   -0.1322   -0.0163   -0.0335    0.0015   -0.0719   -0.0445
112    0.0240    0.1464   -0.0447    0.0255    0.0179    0.0661   -0.0577   -0.0953
113   -0.0586   -0.0377   -0.1052   -0.0615   -0.0826   -0.0761   -0.0734    0.1520
114    0.0274    0.1284    0.0121   -0.0827    0.1379   -0.1422   -0.0526    0.0399
115    0.1207   -0.0650   -0.2430   -0.2552   -0.0302   -0.2157    0.0427    0.0232
116   -0.0599   -0.0766    0.3466    0.4536   -0.0418    0.4303    0.1774   -0.3004
117   -0.2225   -0.2967    0.1149    0.0550    0.2435    0.0927    0.2566    0.1035
118    0.0153   -0.2737    0.0909    0.1491    0.1427    0.1399    0.1974    0.0081
119   -0.1216   -0.3400    0.1215    0.1150    0.2177    0.1289    0.2633    0.0663
120    0.0400   -0.1574   -0.1619   -0.1420   -0.0873   -0.0497    0.1579    0.0702
121   -0.0122   -0.0551    0.0140    0.0587   -0.1559    0.1021   -0.0033   -0.0065
122    0.0518   -0.1639    0.0808    0.0692    0.0316    0.1075    0.0413    0.0553
123    0.0430   -0.1470   -0.0287   -0.0090   -0.0795    0.0930    0.0698    0.0427
124   -0.1235   -0.0850    0.0245    0.0447    0.1363    0.0843    0.0914    0.0212

       COL.      COL.      COL.      COL.      COL.      COL.      COL.      COL.
       41        42        43        44        45        46        47        48
ROW

  1   -0.0449    0.0003    0.0134   -0.1144    0.0751    0.0134   -0.1130   -0.1216
  2    0.0225    0.1276    0.1196    0.1183   -0.0018   -0.1026   -0.0209   -0.0532
  3    0.2632    0.2647    0.1679    0.1115    0.1122   -0.0210   -0.0076    0.0223
  4    0.1531    0.0756    0.1968    0.1201    0.2401   -0.0361    0.1775   -0.0567
  5   -0.0204    0.0014    0.0008   -0.0499   -0.0552    0.0574   -0.0325   -0.0815
  6    0.0511   -0.0151    0.0615    0.0161   -0.1294   -0.0026   -0.2054   -0.0751
  7    0.1271    0.0587    0.1392    0.0230   -0.1158   -0.0489   -0.1953   -0.0906
  8    0.0041    0.1229   -0.0063    0.0458    0.0500   -0.1326    0.0004   -0.0797
  9   -0.0944    0.0067   -0.1766    0.2157    0.1714   -0.0781   -0.0930    0.0262
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10	-0.0266	0.0948	-0.0545	0.0603	0.0864	-0.1651	0.0420	-0.0413
11	0.2294	0.2021	0.0685	0.1310	0.1769	-0.0102	-0.1514	0.2591
12	0.1866	0.1512	0.0531	0.0847	0.2476	-0.0520	0.1279	0.0917
13	0.2364	0.1477	0.0579	0.1691	0.2385	-0.1218	0.0689	-0.1714
14	-0.0922	-0.0446	-0.0576	0.0333	0.0126	-0.0324	-0.0502	-0.0802
15	-0.0746	-0.0411	-0.1597	0.1711	0.0946	-0.1624	0.0541	-0.1521
16	-0.0817	-0.0364	-0.1863	-0.1118	0.0029	0.0147	0.0484	0.0660
17	0.0302	0.0366	-0.2045	0.2591	0.3964	-0.1561	0.0890	0.1251
18	-0.0328	-0.0757	-0.0552	0.0474	-0.0662	-0.0064	0.0692	-0.1647
19	-0.0402	-0.0958	-0.0742	0.0701	-0.0519	-0.0095	0.0404	-0.1466
20	-0.0526	0.0137	0.0201	-0.0100	-0.1641	0.0369	-0.1724	-0.0390
21	-0.0454	-0.0729	-0.0946	-0.1229	0.0021	0.0809	0.0631	-0.7068
22	-0.0532	-0.0618	-0.1474	0.0778	0.1884	-0.0285	0.0180	0.0646
23	0.2067	0.1433	0.2275	-0.0161	0.1371	-0.0325	0.2413	0.0413
24	-0.1931	-0.2025	-0.0613	-0.0983	-0.2059	0.0987	-0.0912	-0.1127
25	0.2003	0.2567	0.2421	0.1467	0.1049	-0.1657	-0.0182	0.1477
26	0.1166	0.0488	0.1405	0.0410	0.0208	-0.0243	-0.0660	0.0569
27	0.0439	-0.0212	0.0231	0.0717	-0.0340	-0.0713	-0.0402	0.0459
28	0.0947	0.0272	0.0755	0.0444	0.0186	-0.0283	-0.0246	0.0997
29	0.0484	0.0595	0.0309	0.0513	0.0394	-0.1540	0.0550	0.0762
30	0.1281	0.0662	0.0462	0.0943	0.0466	-0.1079	0.0654	0.1246
31	0.0799	0.0554	0.0823	0.0249	-0.0739	-0.0623	0.0423	0.1539
32	0.2508	0.2083	0.1497	0.3304	0.3121	-0.3055	0.0278	-0.0864
33	-0.1624	-0.1923	-0.1266	-0.2580	-0.2042	0.2068	-0.0136	0.0041
34	-0.1706	-0.1257	-0.0121	-0.1375	-0.1424	-0.0207	0.0068	-0.0321
35	-0.0348	0.0554	-0.3601	0.1904	0.3708	-0.1372	0.1513	-0.1609
36	-0.1044	-0.0512	-0.3041	0.2053	0.2826	-0.0752	-0.0861	-0.0532
37	0.0606	0.1044	0.0851	0.1756	0.0428	-0.1472	0.2043	-0.0728
38	-0.0164	0.0086	-0.3206	0.2481	0.4307	-0.1383	-0.0690	-0.1019
39	-0.0707	-0.0765	-0.1807	0.1627	0.1291	-0.3677	-0.0475	-0.1464
40	0.2253	0.1414	0.0559	0.0826	-0.0676	0.1562	0.0737	-0.0262
41	1.0000	0.7260	0.7026	0.1613	0.4145	0.0336	0.0896	0.1077
42	0.7266	1.0000	0.5251	0.2724	0.4598	-0.1816	0.0270	0.0172
43	0.7026	0.5251	1.0000	-0.0057	0.1290	0.1005	0.0234	0.1180
44	0.1618	0.2724	-0.0057	1.0000	0.4737	-0.2653	0.0193	0.1353
45	0.4145	0.4598	0.1290	0.4737	1.0000	-0.2505	0.0202	-0.0671
46	0.0336	-0.1816	0.1005	-0.2653	-0.2505	1.0000	-0.0693	0.1963
47	0.0896	0.0270	0.0234	0.0193	0.0202	-0.0693	1.0000	-0.1274
48	0.1077	0.0172	0.1180	0.1353	-0.0671	0.1963	-0.1274	1.0000
49	-0.0404	-0.0270	-0.0297	0.0430	-0.1405	0.0744	-0.0502	0.3522
50	0.2303	0.2459	0.2541	0.1058	0.2041	0.2705	-0.2266	0.2162
51	0.0607	-0.0670	0.0516	0.0705	0.0499	0.1752	0.0369	0.0259
52	0.1044	0.0392	0.2019	-0.0394	-0.0678	0.1175	0.1216	-0.0127
53	-0.0438	-0.0558	-0.1193	0.0345	-0.0389	-0.1158	0.0374	0.0165
54	-0.0538	-0.0327	-0.0716	0.0415	-0.0295	0.0787	-0.1321	0.2306
55	0.0258	-0.0814	0.0381	-0.0072	-0.1409	0.0195	-0.0781	0.2066
56	-0.1120	-0.1038	-0.0276	-0.0355	-0.1752	-0.0163	0.1694	-0.1203
57	0.0922	0.0796	-0.0472	-0.2009	-0.0124	-0.0923	-0.1904	-0.0709
58	-0.4182	-0.3546	-0.1969	-0.0785	-0.3549	0.1193	-0.0585	0.0627
59	-0.2025	-0.2663	0.0199	-0.1763	-0.2295	0.1100	-0.1410	-0.0605
60	-0.2747	-0.2391	-0.1509	-0.0346	-0.0231	-0.0601	-0.0143	-0.0991
61	-0.1350	-0.1256	0.0104	-0.1275	-0.1877	0.0609	-0.1257	-0.1223
62	[illegible]	-0.1283	0.0466	0.0959	-0.2554	-0.0323	0.1662	0.0219
63	-0.0315	-0.0404	0.0869	-0.2146	-0.1502	0.0246	-0.3460	-0.0044
64	-0.0730	-0.0278	-0.0378	0.0215	-0.0084	-0.0725	0.0712	-0.1341
65	0.1792	0.0855	-0.0018	-0.0489	0.1151	0.1543	0.0036	-0.0664
66	0.0641	0.1721	0.0272	-0.0219	-0.0384	0.0161	-0.0268	-0.0244
67	0.0484	0.0151	0.0514	-0.1279	-0.1353	0.0373	0.1540	-0.0419
68	0.0355	0.0154	0.0569	-0.0755	0.0129	0.1480	-0.0650	0.0054
69	0.2944	0.2232	0.2239	0.1147	0.1490	-0.1912	0.1322	0.1569
70	-0.1606	-0.1141	-0.0130	0.0779	-0.0916	0.1270	0.0150	-0.0525
71	0.0446	0.0612	0.0171	-0.0246	0.0072	0.2151	0.0164	0.1349
72	-0.0503	-0.0493	-0.1288	0.0011	-0.0359	-0.0420	0.1771	-0.0749
73	-0.0914	-0.0057	-0.0341	0.0013	-0.0878	-0.0179	0.1872	-0.0385
74	-0.0190	0.0766	-0.1225	-0.1086	-0.0032	-0.0552	0.0445	-0.0563
75	-0.1345	-0.2954	-0.0274	-0.0861	-0.1662	0.3119	0.0710	0.0717
76	-0.0599	-0.0637	-0.0109	-0.0397	-0.1127	0.0695	0.0831	0.1419
77	-0.0014	0.0649	-0.0005	0.1120	0.0715	-0.1633	-0.0064	0.0917

```
        78    0.0274     -0.0200      0.0884      0.0862     -0.1641      0.1344     -0.0293      0.1818
        79    0.0963      0.1480      0.2129     -0.0105     -0.0728      0.0772      0.1229      0.2090
        80    0.1424      0.1095      0.0445      0.0035     -0.1420      0.0772     -0.0293      0.0082
O.C.    81   -0.1606     -0.0462     -0.1108      0.1012     -0.1188     -0.1953      0.2765     -0.0178
        82    0.0598      0.1615      0.0259      0.2450      0.0001     -0.1287      0.1552     -0.1326
        83    0.0529      0.0850      0.0117      0.1966     -0.0076     -0.0911      0.0578     -0.0554
        84    0.1610      0.0979      0.0040      0.1428      0.1346     -0.0042      0.1364      0.0076
        85    0.0199      0.0507      0.1272      0.0408     -0.1026      0.0115     -0.3137      0.1866
        86   -0.0405      0.1339     -0.0584      0.1231     -0.0662     -0.0217     -0.1048     -0.1067
        87    0.2393      0.2619      0.1016      0.1199      0.0655     -0.0150     -0.0895      0.0576
        88    0.1161      0.0996      0.0432      0.1959     -0.0118     -0.0410     -0.1768     -0.0300
        89    0.0665     -0.0225      0.0530      0.0866      0.1062     -0.1209     -0.0655     -0.0546
        90   -0.1455     -0.1345     -0.2476     -0.0077      0.0481     -0.1758     -0.2429     -0.1314
        91   -0.0445     -0.0735     -0.0966      0.1315      0.0456     -0.2251     -0.0675      0.0563
        92    0.1027      0.1138     -0.0029      0.1491      0.2493      0.0957     -0.0129      0.0152
        93   -0.0760     -0.1013     -0.0438      0.0964      0.1281     -0.1654      0.2092     -0.0144
        94   -0.0775      0.0362     -0.0623      0.0793      0.0999     -0.1337      0.0520      0.0134
        95   -0.0601     -0.1013     -0.0696      0.0517      0.0225      0.0339     -0.1155      0.0104
        96    0.1215      0.1423      0.0163      0.0120      0.1065     -0.1584     -0.0960     -0.2567
        97   -0.0169     -0.0739     -0.0552      0.0006      0.0678     -0.0796     -0.0421      0.0194
        98    0.1531      0.1227      0.1171     -0.1335      0.1857      0.0141      0.0285     -0.0292
        99    0.0857      0.0506      0.0713      0.0021      0.0433     -0.0473     -0.1693     -0.0412
       100   -0.0558      0.1143      0.0532      0.1191      0.0078     -0.2253      0.1293     -0.0458
       101   -0.0073      0.1343     -0.1206      0.0337     -0.0192     -0.1908      0.0055     -0.0412
       102   -0.0782     -0.0082     -0.0747     -0.1743     -0.0584      0.1544      0.1269      0.0015
       103   -0.0117      0.0360      0.0092     -0.0057      0.0158      0.0664     -0.0412     -0.0311
       104    0.0103     -0.1324     -0.0511     -0.0282     -0.0162      0.1966     -0.1432      0.0454
       105    0.0584      0.0477     -0.0012      0.0849      0.0003      0.0575      0.0096      0.1634
       106    0.1654      0.1712      0.0601      0.1002      0.1035     -0.0274     -0.1775     -0.2679
       107    0.0500      0.1537      0.0832      0.0218      0.0612      0.0133     -0.1644     -0.0991
       108    0.0359      0.0208      0.0009     -0.0236      0.1253     -0.0145     -0.0277     -0.1564
       109   -0.0027      0.0139      0.0557      0.0041     -0.0901     -0.1450      0.1404      0.0451
       110   -0.0557     -0.0174      0.0407      0.0198      0.1689     -0.0349     -0.0264     -0.0707
       111   -0.0849     -0.0602     -0.0083      0.0355      0.0795      0.0836     -0.1427      0.0575
       112   -0.1919     -0.1536     -0.1986      0.2552      0.1059      0.0685      0.0690     -0.0339
       113    0.0162      0.1036      0.0325      0.0147      0.0091     -0.0391     -0.0704     -0.1347
       114    0.0584     -0.0255      0.0486     -0.1600     -0.2035     -0.0102      0.1936      0.0485
       115    0.0120      0.0777      0.1001      0.0172     -0.0639      0.0871     -0.0279      0.1327
       116   -0.1129     -0.1769     -0.2007      0.2072      0.3230     -0.0072     -0.1411      0.0096
       117    0.6794      0.5877      0.5284      0.2625      0.3516     -0.1497      0.1587      0.0779
       118    0.3161      0.4357      0.2049      0.1662      0.3061     -0.2097      0.0308      0.0677
       119    0.5247      0.5758      0.4280      0.2527      0.3857     -0.1865      0.1042      0.0866
       120    0.3319      0.3043      0.3123      0.1975      0.1622     -0.1203     -0.0148     -0.0358
       121    0.1498      0.1867      0.1636      0.0804      0.1569     -0.1412     -0.0650     -0.0565
       122    0.1510      0.2427      0.1025      0.2188      0.1691     -0.1687      0.0701     -0.1041
       123    0.2452      0.2826      0.2237      0.1922      0.1868     -0.1642     -0.0026     -0.0749
       124    0.0987      0.0680      0.1795      0.0566      0.0551      0.0019     -0.1003      0.0220

              COL.        COL.        COL.        COL.        COL.        COL.        COL.        COL.
              49          50          51          52          53          54          55          56
       ROW

         1    0.0195      0.0538     -0.1054     -0.1258     -0.0361     -0.0876     -0.1075     -0.0377
         2    0.0240     -0.1684     -0.0070     -0.0861     -0.0810     -0.0429     -0.2404      0.0646
         3   -0.1485      0.1106     -0.1140     -0.0160     -0.1020     -0.0922     -0.0727     -0.0500
         4   -0.0003      0.0812     -0.0854      0.0263     -0.1147     -0.0709     -0.0661     -0.1036
         5    0.0463     -0.0454     -0.0442     -0.0295      0.0078     -0.0781     -0.0474     -0.0265
         6    0.1253     -0.0347      0.1247      0.1027     -0.1827      0.0423     -0.0806     -0.1331
         7    0.1101      0.0206      0.1399      0.1361     -0.1600     -0.0758     -0.0882     -0.1147
         8    0.0076     -0.1655      0.0509      0.0345      0.1044      0.0662      0.1019      0.0054
         9    0.0446     -0.0687      0.0417      0.0720      0.0072      0.0971      0.1107      0.0365
        10    0.0665     -0.1476      0.0711      0.0649      0.0411      0.0807      0.1217     -0.2670
        11    0.0061      0.2153     -0.0189     -0.0571     -0.0538      0.1140      0.0017     -0.0673
        12   -0.0362     -0.0076     -0.0097     -0.3057     -0.0503      0.0899     -0.0609      0.0063
        13   -0.0666      0.0162     -0.0124     -0.0114     -0.1765     -0.0790     -0.2469     -0.0175
        14    0.0494     -0.0415     -0.0699     -0.1024      0.0218      0.0678      0.0274     -0.1900
        15    0.0737     -0.0763      0.0023     -0.0050     -0.0516     -0.1060     -0.1398     -0.3090
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o.c.

16	0.0745	0.0482	-0.1083	-0.2387	-0.0693	-0.0014	0.0250	-0.0971
17	0.1113	-0.0077	0.0434	-0.0373	-0.0134	0.3111	0.0452	-0.0428
18	-0.0069	-0.1483	0.0656	0.0213	0.0674	0.1036	0.0897	0.1834
19	-0.0367	-0.1466	0.0701	-0.0140	0.0775	0.1055	0.1042	0.1554
20	0.0915	0.0434	0.0030	0.0820	0.0243	-0.0056	-0.0591	0.0454
21	-0.0582	0.1118	0.0373	0.0503	-0.0171	0.0309	0.0440	0.0452
22	0.0755	0.0701	0.0820	-0.1031	-0.0700	0.0131	-0.0319	-0.2030
23	-0.0480	0.0486	0.1476	0.1297	-0.0612	0.0333	-0.0473	-0.2027
24	0.1216	-0.0597	0.0637	-0.1613	-0.0031	-0.0663	-0.0871	-0.1062
25	0.0513	0.1178	0.1312	0.1922	-0.1794	0.0623	-0.0654	-0.2686
26	0.0973	0.0814	0.0278	0.1375	-0.2563	0.1131	0.1947	-0.2429
27	0.1316	-0.1626	-0.0514	0.0821	-0.2575	-0.0374	0.1909	-0.2469
28	0.1267	0.0651	0.0038	0.1247	-0.2829	0.1791	0.1538	-0.1959
29	0.0301	-0.0257	-0.1423	0.2351	-0.0874	0.2083	0.0363	-0.1235
30	0.0869	0.0262	-0.1415	0.1436	-0.0716	0.1008	-0.0166	-0.1432
31	0.1167	-0.0133	-0.0571	0.1957	-0.0420	0.1427	0.1216	-0.1192
32	0.0097	0.1226	-0.0173	0.0325	0.1055	-0.0638	-0.0791	-0.0785
33	-0.0904	-0.2270	0.0524	0.0183	0.0167	0.0597	0.0901	-0.0341
34	-0.0407	0.0824	-0.0654	-0.0882	-0.1662	-0.0542	0.0113	0.2861
35	-0.1605	-0.1055	-0.1205	-0.2080	0.0328	0.0638	-0.1286	0.1224
36	-0.1373	-0.0465	-0.1286	-0.2069	0.0310	0.0835	-0.1434	[illegible]
37	-0.1864	0.0155	-0.0483	-0.0039	-0.0492	-0.2162	-0.1397	0.2335
38	-0.1144	-0.0569	-0.1264	-0.1926	0.0687	0.0734	-0.1392	[illegible]
39	0.0380	-0.0798	-0.1579	-0.1149	0.0509	-0.0214	-0.0435	-0.1558
40	0.0696	-0.1215	0.0639	0.0299	0.2509	-0.1047	0.0267	-0.0112
41	-0.0404	0.2303	0.0507	0.1044	-0.0438	-0.0538	0.0258	-0.1130
42	-0.0370	0.2489	-0.0670	0.0392	-0.0558	-0.0327	0.0314	-0.1058
43	-0.0297	0.2641	0.0516	0.2019	-0.1193	-0.0710	0.0351	-0.0276
44	0.0430	0.1058	0.0705	-0.0394	0.0345	0.0415	-0.0072	-0.0445
45	-0.1405	0.2041	0.0499	-0.0678	-0.0389	-0.0295	-0.1409	-0.1262
46	0.0744	0.2705	0.1752	0.1175	-0.1158	0.0797	0.0185	-0.0162
47	-0.0852	-0.2256	0.0349	0.1215	0.0374	-0.1221	-0.0781	0.1094
48	0.3922	0.2172	0.0259	-0.0027	0.0185	0.2396	0.2088	-0.1203
49	1.0000	0.1967	0.1172	0.0078	0.0125	0.2092	0.3396	-0.2715
50	0.1967	1.0000	0.0575	-0.0282	-0.2904	0.1237	0.1747	-0.1624
51	0.1172	0.0575	1.0000	0.1059	0.0342	-0.0372	0.0164	-0.0014
52	0.0078	-0.0282	0.1099	1.0000	-0.1512	-0.0437	-0.0782	-0.1616
53	0.0125	-0.2904	0.0142	-0.1512	1.0000	0.0308	0.0983	0.0858
54	0.2092	0.1237	-0.0337	-0.0437	0.0308	1.0000	0.4159	-0.1049
55	0.3396	0.1747	0.0164	-0.0782	0.0983	0.4199	1.0000	-0.0612
56	-0.2715	-0.1624	-0.0884	-0.1616	0.0858	-0.1049	-0.0812	1.0000
57	-0.0643	-0.0943	-0.0302	-0.0276	0.0116	0.0179	-0.1001	-0.0949
58	0.1441	-0.0953	0.1703	-0.0984	-0.1276	-0.0003	0.0157	0.1152
59	0.0325	0.0186	-0.0113	-0.0308	0.0306	-0.0852	0.0172	0.2240
60	-0.0146	-0.0167	0.1565	0.0309	0.1364	-0.0740	0.1077	-0.0056
61	-0.0659	0.0711	-0.0999	0.0922	-0.0431	-0.1346	-0.1635	0.0109
62	0.0052	0.0421	-0.0232	0.0366	0.0965	-0.1644	-0.0161	0.0185
63	0.1407	0.1279	-0.1791	-0.1480	-0.0509	-0.1067	-0.0406	-0.0446
64	0.0028	-0.0054	-0.0526	-0.0700	-0.0403	-0.1299	-0.1633	[illegible]
65	-0.1225	-0.1266	-0.1490	[illegible]	-0.0859	-0.0276	0.0565	0.0719
66	-0.0854	0.0466	-0.1447	-0.2177	-0.0191	0.0885	-0.0444	0.1665
67	0.1255	0.0102	-0.0962	-0.0334	0.2771	0.1354	0.1004	-0.1567
68	-0.0545	0.1261	0.0747	0.0917	-0.1290	0.1033	0.1554	-0.2152
69	0.0700	0.0408	0.1313	0.0333	0.1274	-0.0502	0.1687	-0.0065
70	0.1347	-0.0165	-0.0352	0.0254	0.0886	0.0598	0.0350	0.0346
71	0.2512	0.0546	-0.1301	-0.0275	-0.0154	0.1349	-0.0345	0.0150
72	0.0644	-0.0616	-0.0604	0.0974	0.0471	-0.0502	-0.0713	0.0715
73	0.0193	0.0114	-0.0736	-0.0775	0.1993	0.1313	0.1265	0.0570
74	-0.0882	-0.1018	-0.0070	0.0483	0.0208	0.0101	-0.0153	0.1148
75	-0.1566	0.0317	-0.0205	0.0187	0.2017	0.0735	-0.0432	0.1769
76	0.0443	0.0413	0.0427	-0.0664	0.1446	0.2976	0.1675	-0.0096
77	0.2243	0.1406	-0.0090	-0.0526	0.0201	0.0246	0.0225	-0.1839
78	0.1916	0.1155	0.0267	-0.0240	-0.0084	0.0110	0.1180	0.2317
79	0.0010	-0.0186	-0.0573	-0.0631	0.0727	0.1147	0.2695	0.0607
80	0.0143	-0.0874	0.0046	-0.1362	0.2273	0.0751	0.0519	0.2104
81	-0.0691	-0.1560	-0.0520	-0.0701	0.0238	-0.0431	0.0231	0.1888
82	0.0843	0.0712	0.0180	0.1155	-0.0939	-0.0294	0.0599	0.1039
83	0.1042	0.0100	0.0630	0.0705	-0.0288	0.0523	0.0601	0.0503

DC.

```
  84   0.1280    0.1606    0.0834    0.1627   -0.1189    0.1152   -0.0381   -0.0459
  85   0.0956    0.1349   -0.1478   -0.0725    0.1014    0.0110    0.0733    0.1333
  86   0.0403    0.0225   -0.0671   -0.0828   -0.0498    0.0427    0.0303    0.1264
  87   0.1731    0.1157   -0.0280    0.0543    0.0914   -0.0142   -0.0079    0.0336
  88   0.1435    0.0175   -0.1152    0.0505   -0.0095   -0.0605    0.0978   -0.0219
  89  -0.0541    0.0024    0.1442    0.1422    0.0552   -0.1673   -0.0561   -0.0522
  90  -0.2338   -0.0483    0.0993    0.1340   -0.0068    0.0894   -0.0068   -0.0646
  91   0.1163    0.0659    0.0352   -0.0961   -0.0266    0.0353    0.1401   -0.1135
  92   0.0477    0.1104    0.0910    0.1452   -0.0008    0.0546   -0.0090   -0.1803
  93   0.0648   -0.1457   -0.0066   -0.0639    0.1709    0.0329   -0.0075   -0.0163
  94   0.0169   -0.0240   -0.1461    0.0451    0.1886   -0.1694    0.0055   -0.0744
  95   0.0061   -0.0173   -0.0066    0.0277    0.2455   -0.1692    0.0146   -0.0369
  96  -0.0550   -0.1331   -0.1613    0.0578    0.2038   -0.0990   -0.0997   -0.0648
  97  -0.0900    0.0157   -0.1504   -0.0053    0.1002   -0.0646   -0.0786    0.0295
  98  -0.0642    0.2400   -0.0654   -0.0709   -0.0155    0.0779   -0.0661   -0.1036
  99  -0.1638    0.0178   -0.1433   -0.1279   -0.0544    0.0459    0.0943   -0.0171
 100   0.0446   -0.0675   -0.0751    0.0553   -0.0529    0.0955    0.0434   -0.0411
 101   0.0436   -0.0877    0.0564    0.0879   -0.0074   -0.1259   -0.0136   -0.0909
 102   0.0460    0.0502    0.0124    0.0679    0.0777    0.0103   -0.1610   -0.0541
 103   0.0107    0.0732   -0.2767   -0.0768    0.0495    0.0079   -0.0001   -0.0776
 104   0.0033    0.1145    0.0473    0.0844   -0.0350    0.0393   -0.1127   -0.2733
 105  -0.0166   -0.0325    0.1447    0.1373    0.0902    0.0047    0.1336   -0.0196
 106  -0.0905   -0.0504    0.0098    0.0099   -0.0091   -0.0862    0.0118   -0.0126
 107   0.1057    0.1042   -0.1341   -0.2504   -0.0464   -0.0240    0.0361   -0.0426
 108  -0.0768    0.0570   -0.0176   -0.0746   -0.0845   -0.1376   -0.1729   -0.1021
 109   0.0703    0.0445   -0.0178    0.1978    0.0127   -0.0752    0.1106   -0.1245
 110  -0.1438   -0.0128   -0.1433    0.0355   -0.1008   -0.2187   -0.0354   -0.0415
 111   0.0576    0.0618   -0.1653    0.2312   -0.0861    0.0700   -0.0309   -0.1772
 112   0.1171    0.0923   -0.0554   -0.1349   -0.1491    0.0834    0.0440    0.0781
 113  -0.0373    0.0327    0.0484   -0.1186    0.0005   -0.0854   -0.0411   -0.1218
 114  -0.1976   -0.1435   -0.0188    0.0459   -0.0250   -0.1046    0.0471    0.2201
 115   0.1494    0.1179    0.1071    0.3014    0.0832    0.1414    0.1243   -0.1426
 116   0.1251   -0.0275   -0.1354   -0.1429   -0.0405    0.1334   -0.1164   -0.1407
 117  -0.0559    0.2919   -0.0170    0.1122   -0.1522   -0.0619   -0.0021   -0.1470
 118   0.0560    0.1370    0.0051   -0.0002   -0.1359    0.0761    0.0423   -0.1123
 119  -0.0107    0.2442   -0.0002    0.0533   -0.1551   -0.0184    0.0155   -0.1547
 120  -0.1308    0.0943    0.0165    0.1464   -0.1245    0.1453    0.0658   -0.0378
 121  -0.1314    0.0468   -0.1298    0.0857   -0.1532    0.1336    0.0112   -0.0051
 122  -0.1339   -0.0739    0.0661    0.1033   -0.0509    0.1272    0.0176   -0.0115
 123  -0.1547    0.0764   -0.0152    0.1504   -0.1250    0.1567    0.0134   -0.0314
 124  -0.0793    0.1197   -0.0166    0.0534   -0.1349   -0.0091   -0.2143   -0.0476

       COL.      COL.      COL.      COL.      COL.      COL.      COL.      COL.
       57        58        59        60        61        62        63        64
 ROW

   1   0.1176   -0.0296    0.1097   -0.1316   -0.1492   -0.0726    0.1033    0.1736
   2  -0.0583    0.0473   -0.0031   -0.2124   -0.0101    0.0726    0.0758    0.1637
   3  -0.0427   -0.1459   -0.0432    0.0469    0.0337    0.1259    0.0457   -0.1141
   4  -0.0459   -0.1657    0.0855   -0.1516   -0.0972   -0.0787    0.0319   -0.0665
   5   0.0237   -0.2026   -0.0096   -0.1262   -0.1164    0.0782    0.0424    0.0528
   6  -0.1280    0.3156    0.1065    0.0720    0.2167    0.1000    0.2469    0.0742
   7  -0.1261    0.2470    0.0378    0.0575    0.2167    0.1450    0.2647    0.1264
   8   0.0759   -0.0327   -0.0272    0.0877   -0.0360   -0.1037   -0.1749   -0.0913
   9  -0.0124   -0.1620   -0.1726    0.0767   -0.0493   -0.0431   -0.0659   -0.1217
  10   0.0319    0.0512   -0.0273    0.1406    0.0177   -0.0434   -0.1617   -0.0649
  11  -0.0166   -0.2166   -0.1397   -0.0233   -0.0019    0.0537    0.0855   -0.1520
  12  -0.0701   -0.1056   -0.1477   -0.1190   -0.1567   -0.0397   -0.0326   -0.0235
  13   0.0760   -0.0862   -0.1455   -0.1852    0.0645    0.1277   -0.1128   -0.0324
  14   0.2012   -0.2665   -0.2351    0.0144   -0.1587    0.0361    0.1754   -0.1161
  15   0.0183   -0.1605   -0.1417   -0.0743   -0.0437    0.0754    0.1481    0.0254
  16   0.0732   -0.1776   -0.2081   -0.0380    0.0514    0.0596    0.2004    0.1141
  17  -0.0684   -0.0567   -0.2098    0.0204   -0.0469   -0.1546   -0.1033    [illegible]
  18  -0.0649    0.1131    0.0880    0.0485   -0.0767   -0.1498   -0.0236   -0.1542
  19  -0.0915    0.1162    0.1047    0.0639   -0.0595   -0.1341   -0.0115   -0.1311
  20  -0.0133    0.0232    0.1675    0.1665    0.0609    0.0977    0.2532    0.0510
  21  -0.0013    0.0396    0.1057    0.0905    0.0752   -0.0476    0.0286    0.0900
```

c.c.

```
22   -0.0896    0.0706   -0.1857   -0.0436   -0.0586   -0.0266    0.1150    0.1236
23    0.0238   -0.0779   -0.2372   -0.0371    0.0403   -0.1008   -0.0896   -0.0194
24   -0.0594    0.2150    0.1149    0.0100    0.0344    0.2114    0.1992    0.3270
25    0.0878   -0.0136   -0.0392   -0.0104   -0.1009    0.0609    0.0475   -0.0418
26   -0.0147    0.0456    0.0561    0.2750   -0.0575    0.0763    0.1165   -0.0417
27    0.0310    0.0421    0.0110    0.1444   -0.1139    0.0746    0.0516   -0.1044
28   -0.0224    0.0041   -0.0102    0.1975   -0.1184    0.0569    0.0701   -0.1291
29   -0.0766   -0.0388   -0.0197   -0.0166   -0.0273    0.1467   -0.0128   -0.0505
30    0.0376   -0.0412   -0.1015   -0.0683   -0.0409    0.1175   -0.0389   -0.0584
31    0.0747   -0.0351   -0.0676   -0.0415   -0.0381    0.1071    0.0203   -0.1217
32    0.1176   -0.1727   -0.1759    0.0270   -0.0963    0.1047   -0.0670   -0.0179
33   -0.0331    0.0439    0.0446   -0.0850   -0.0044   -0.1443    0.0519    0.0425
34   -0.1568    0.2151    0.2326    0.1967    0.2768    0.1418    0.0386   -0.0348
35    0.1716   -0.1611   -0.0450   -0.0707   -0.1943   -0.3767   -0.3713    0.0244
36    0.1151   -0.1764    0.0126    0.0741   -0.2116   -0.3651   -0.1123   -0.1070
37    0.0882    0.0365   -0.0635   -0.1633   -0.1176   -0.0121   -0.1486   -0.0453
38    0.0651   -0.7131    0.0047   -0.0371   -0.1441   -0.2520   -0.1700   -0.0366
39    0.2064   -0.0939   -0.0382    0.0066   -0.1766   -0.0077    0.2281    0.2544
40   -0.0945   -0.1719   -0.0444   -0.0533   -0.0059    0.1536   -0.0004   -0.0010
41    0.0922   -0.4182   -0.2025   -0.2747   -0.1350   -0.0698   -0.0315   -0.0723
42    0.0796   -0.3546   -0.2603   -0.2391   -0.1256   -0.1283   -0.0404   -0.0278
43   -0.0472   -0.1906    0.0149   -0.1509    0.0109    0.0466    0.0569   -0.0375
44   -0.2009   -0.0785   -0.1763   -0.0346   -0.1275    0.0588   -0.2146    0.0215
45   -0.0174   -0.3544   -0.2205   -0.0231   -0.1977   -0.2554   -0.1502   -0.0054
46   -0.0623    0.1193    0.1100   -0.0601    0.0609   -0.0233    0.0246   -0.0735
47   -0.1004   -0.0595   -0.1410   -0.0143   -0.1257    0.1562   -0.3460    0.0312
48   -0.0709    0.0927   -0.0605   -0.0991   -0.1220    0.0719   -0.0094   -0.1343
49   -0.0643    0.1441    0.0329   -0.0140   -0.0059    0.0097    0.1407    0.0075
50   -0.0943   -0.0653    0.0186   -0.0167    0.0711    0.0421    0.1779   -0.0054
51   -0.0302    0.1703   -0.0113    0.1565   -0.0939   -0.0272   -0.1791   -0.0516
52   -0.0276   -0.0084   -0.0308    0.0309    0.0927    0.0358   -0.1490   -0.0700
53    0.0116   -0.1276    0.0306    0.1364   -0.0431    0.0065   -0.0509   -0.0403
54    0.0178   -0.0002   -0.0857   -0.0740   -0.1300   -0.1644   -0.1067   -0.1250
55   -0.1001    0.0187    0.0172    0.1072   -0.1635   -0.0161   -0.0404   -0.1633
56   -0.0986    0.1152    0.2249   -0.0056    0.0109    0.0195   -0.0749   -0.0630
57    1.0000   -0.3333   -0.2784   -0.1978   -0.2530   -0.4522   -0.0985    0.0454
58   -0.3333    1.0000    0.4067    0.3099    0.1814    0.2165    0.0125    0.0140
59   -0.2784    0.4067    1.0000    0.1569    0.1185    0.1354   -0.0199   -0.0018
60   -0.1978    0.3099    0.1569    1.0000    0.2431    0.3303    0.0599   -0.0401
61   -0.2530    0.1814    0.1185    0.2431    1.0000    0.4030    0.0673    0.1514
62   -0.4522    0.2165    0.1354    0.3303    0.4030    1.0000    0.1169    0.0777
63   -0.0985    0.0125   -0.0199    0.0599    0.0673    0.1169    1.0000    0.3150
64    0.0454    0.0140   -0.0018   -0.0401    0.1514    0.0777    0.3150    1.0000
65    0.0278   -0.1992   -0.0953    0.0011   -0.0503   -0.2188   -0.1688   -0.1546
66   -0.2260   -0.0404    0.0405   -0.1000    0.1075    0.1149    0.3458    0.0710
67   -0.1103   -0.0732    0.0777    0.0560    0.0316    0.1072    0.0457   -0.0618
68    0.0806   -0.0669    0.0628    0.0078   -0.1753   -0.0470   -0.0240   -0.1165
69    0.0522   -0.2076   -0.1415    0.0519   -0.0081    0.1794   -0.0520    0.0307
70   -0.0597    0.1090    0.0406   -0.0157    0.0307   -0.0766    0.0689   -0.0525
71    0.0030   -0.1291   -0.0022   -0.1837   -0.0800   -0.3190    0.0784   -0.1720
72    0.0020    0.0297   -0.0768    0.1068    0.1210    0.1234   -0.0488   -0.1069
73   -0.1192    0.0591    0.0218    0.0614   -0.0092    0.0377   -0.0537   -0.0590
74    0.0556   -0.0832    0.0232   -0.0169   -0.0365   -0.1915   -0.0219   -0.0276
75    0.0034    0.0717    0.0108    0.0232    0.1118    0.0557   -0.0166   -0.0550
76   -0.1328    0.1124   -0.0465   -0.0475   -0.1405   -0.0873    0.0030   -0.1903
77    0.0156    0.0472   -0.0109   -0.0510   -0.1537   -0.0834    0.0419    0.0050
78   -0.1497    0.0847    0.0528   -0.1761   -0.1171   -0.0020    0.0711   -0.0510
79   -0.2034    0.0034   -0.0821    0.0612   -0.0767    0.0404    0.0147   -0.0963
80   -0.0730    0.0248   -0.0561   -0.0636   -0.0445    0.0748    0.0763   -0.2266
81   -0.0594    0.1258   -0.0050    0.0434   -0.0074    0.1778   -0.1049   -0.0651
82   -0.1360   -0.0717    0.1393   -0.0813   -0.1725    0.0026   -0.1457   -0.0824
83   -0.1236   -0.0397    0.1403   -0.1211   -0.1355   -0.0429   -0.1300   -0.0135
84    0.0209    0.0086    0.1210   -0.1691   -0.2355   -0.0392   -0.1192   -0.0685
85   -0.0534   -0.0204    0.2066   -0.0664   -0.0620   -0.0675    0.1141    0.0065
86   -0.0595    0.0216    0.0277   -0.0221   -0.0177   -0.0721   -0.0303    0.2044
87    0.0609   -0.1765    0.0920   -0.1591   -0.0824   -0.0507    0.1231    0.2163
88   -0.0582   -0.0289    0.1654    0.0446   -0.0047   -0.1161    0.1279    0.0451
89   -0.1360   -0.1994   -0.0616   -0.0767    0.1062   -0.0268   -0.0381   -0.0762
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   90    0.0740   -0.0774   -0.1476    0.0916    0.0392   -0.0961   -0.0660   -0.1050
   91    0.1167    0.0390   -0.0243   -0.0562   -0.1273   -0.0559   -0.1611   -0.1497
   92   -0.0329   -0.1247   -0.0741   -0.0435   -0.1410   -0.1848   -0.1774   -0.1996
   93    0.0293    0.0218   -0.1127    0.0344   -0.0808   -0.0537   -0.1212    0.0762
   94   -0.0035   -0.1172   -0.0220    0.0266   -0.3359   -0.0404   -0.0052   -0.0230
   95   -0.0030   -0.0027    0.0493    0.0704   -0.2880    0.0055    0.0288   -0.1356
   96    0.0605   -0.2191    0.0723   -0.1641   -0.1715   -0.0252   -0.0248   -0.0627
   97    0.0477   -0.0543    0.0663    0.0719   -0.1405   -0.0636    0.0047   -0.2022
   98    0.0523   -0.2346   -0.1954   -0.0959    0.0650   -0.1197    0.0133   -0.0712
   99   -0.0769   -0.0579    0.0745    0.0638   -0.0096    0.1072   -0.0620   -0.1441
  100    0.0242    0.0466    0.0408    0.0137    0.0011    0.0355   -0.1424   -0.0344
  101    0.0342    0.0170   -0.0114    0.1694    0.0511    0.0117   -0.0562    0.0115
  102   -0.1435   -0.0676    0.1028   -0.0910    0.0249    0.0836    0.0935   -0.1235
  103   -0.1342   -0.0641    0.1584    0.0545    0.0642    0.2196    0.1197   -0.1781
  104   -0.1385    0.0761    0.2315    0.0377    0.1510    0.1297    0.0621   -0.0563
  105   -0.1447    0.2104   -0.0229    0.1158   -0.0019    0.3279    0.0693    0.1452
  106   -0.0311    0.0746    0.0666   -0.1577   -0.0147   -0.0416   -0.0127   -0.0021
  107   -0.1410    0.0503    0.0069   -0.0600    0.0327    0.0365    0.1105    0.1054
  108    0.0508   -0.2377   -0.0416   -0.0556   -0.0558   -0.0816    0.1660   -0.0579
  109    0.0545   -0.1179   -0.0884   -0.0496    0.0263    0.0293   -0.1412   -0.0266
  110    0.0752   -0.0293   -0.1056   -0.0219   -0.0702   -0.0336    0.0916   -0.0295
  111    0.1511   -0.0319   -0.2325   -0.0027    0.1715   -0.0632    0.1324    0.0834
  112   -0.0324    0.0653   -0.0206    0.0493    0.0696    0.0165   -0.0620    0.0510
  113   -0.0400    0.0515    0.0378   -0.0141    0.0031   -0.0943    0.1931    0.0713
  114    0.0327   -0.0447   -0.0228    0.0045    0.0792    0.1451   -0.3345   -0.2396
  115   -0.1094    0.1309    0.0961    0.1407    0.0078    0.1850    0.1617    0.1729
  116    0.1391   -0.1221   -0.1081   -0.1103   -0.1170   -0.2249    0.0348    0.0693
  117    0.1559   -0.3552   -0.2427   -0.2376   -0.2144    0.0052   -0.0145    0.0656
  118    0.1552   -0.3023   -0.2654   -0.2391   -0.2613   -0.2205    0.1347    0.0819
  119    0.1749   -0.3678   -0.3061   -0.2589   -0.2607   -0.1170    0.0238    0.0849
  120    0.0273   -0.1494    0.0126   -0.0554    0.0617    0.1160    0.2575    0.0611
  121    0.0047   -0.0976   -0.0202   -0.0516   -0.0176   -0.0087    0.1017   -0.0776
  122    0.0650   -0.1579   -0.1433   -0.1474   -0.0697   -0.0502    0.0286    0.1263
  123    0.0378   -0.1572   -0.0573   -0.1147   -0.0085    0.0240    0.0709    0.0474
  124    0.0332   -0.1068   -0.1208    0.0059    0.0985   -0.0177    0.0464    0.1160

         COL.      COL.      COL.      COL.      COL.      COL.      COL.      COL.
         65        66        67        68        69        70        71        72
  ROW

    1   -0.0576    0.1409    0.1072   -0.0189   -0.1083   -0.0602   -0.0236   -0.1018
    2   -0.0035    0.0825    0.0736   -0.1314   -0.0573   -0.0452    0.1569   -0.2143
    3    0.1122    0.1467    0.0541   -0.0690    0.0411    0.0361   -0.1005   -0.0511
    4    0.0310    0.0163    0.1742    0.1557    0.1162    0.0332    0.0717    0.0637
    5    0.0205   -0.0176    0.0265    0.1178    0.0575   -0.0568   -0.0184   -0.0452
    6   -0.0178   -0.1154    0.0649    0.0523   -0.0319   -0.0859   -0.0743   -0.0660
    7   -0.0417   -0.0335    0.0921    0.0341    0.0185   -0.1357   -0.0629   -0.0663
    8    0.1449   -0.0533   -0.0158    0.2055    0.0704   -0.0605   -0.1031    0.0563
    9    0.0538    0.0114   -0.0701    0.0131    0.1659    0.0150    0.0427    0.1881
   10    0.1167   -0.0238    0.0235    0.2090    0.0466   -0.1855   -0.1530    0.0638
   11   -0.0464    0.1014   -0.1455    0.0272    0.2738   -0.0790    0.0085    0.0523
   12    0.1548    0.1728    0.0295   -0.0501    0.0912   -0.1098    0.0989   -0.0667
   13    0.1637    0.0474   -0.0562   -0.1557   -0.0194   -0.0853   -0.1086    0.1396
   14   -0.0707   -0.1249    0.1203    0.1235   -0.0029    0.0352    0.1079    0.2601
   15    0.0012   -0.1403   -0.0877    0.1624   -0.0222   -0.0427    0.0116    0.2342
   16   -0.0230    0.0799    0.0746    0.2349    0.0048   -0.1527    0.1148    0.1079
   17    0.1783    0.0736   -0.0313   -0.0020    0.1145   -0.1557    0.0421   -0.0505
   18    0.1127    0.0953    0.1379   -0.0741   -0.0926    0.2659    0.0048    0.1933
   19    0.0966    0.1063    0.1227   -0.0374   -0.1021    0.2302    0.0920    0.1494
   20   -0.2512   -0.0124    0.0393   -0.1285   -0.2038    0.2040    0.1169    0.0750
   21    0.0188   -0.0282    0.0715   -0.0146   -0.1626    0.1220    0.0555    0.0191
   22   -0.2149    0.0151    0.0875    0.0004   -0.0511    0.0488   -0.0042   -0.0725
   23    0.0249   -0.0458   -0.0017    0.2099    0.0773   -0.1592    0.1104    0.0515
   24   -0.2837    0.0221    0.0996   -0.0731   -0.0287   -0.0731   -0.0723   -0.1485
   25   -0.2413    0.0013   -0.1393    0.2951    0.2418   -0.1943   -0.0657    0.0073
   26    0.1506    0.0183   -0.0874    0.1833    0.2081   -0.2125   -0.1926    0.1134
   27    0.0760   -0.0697   -0.0384    0.1734    0.0794   -0.2211   -0.0541    0.1420
```

OC.

O.C.

28	0.1267	0.0733	0.0200	0.1077	0.1659	-0.2952	-0.0529	0.1469
29	-0.0785	-0.0174	-0.1676	0.0943	0.1739	-0.2080	-0.0472	0.1418
30	-0.0712	-0.0649	-0.1727	0.0355	0.1603	-0.2099	0.0252	0.1510
31	-0.0556	-0.1035	-0.1300	0.0488	0.2026	-0.1535	-0.0043	0.1522
32	-0.1130	-0.0251	0.0303	-0.0779	0.2648	-0.0259	-0.0109	-0.0331
33	0.1046	-0.0294	0.0409	0.1055	-0.3188	0.0185	-0.0412	0.0495
34	-0.0729	0.1728	-0.1253	-0.0308	0.0127	-0.0145	-0.0973	-0.0334
35	0.1740	0.0557	-0.0812	0.1347	-0.0590	-0.2174	0.1256	-0.0077
36	0.1555	0.0649	-0.0494	0.0376	-0.1077	-0.1937	0.1878	0.0188
37	0.1046	0.0057	-0.1835	-0.1002	0.0204	0.0496	-0.0481	0.1492
38	0.1465	0.0534	-0.0996	0.0112	-0.0413	-0.1511	0.1200	0.0165
39	0.0019	-0.1361	0.0320	0.0710	0.0995	-0.1241	-0.0220	0.1126
40	0.0667	-0.0340	0.1224	-0.1734	0.0927	0.0847	0.0703	0.0826
41	0.1793	0.0641	0.0484	0.0355	0.2044	-0.1606	0.0096	-0.0503
42	0.0855	0.1721	0.0151	0.0154	0.2232	-0.1141	0.0612	-0.0443
43	-0.0018	0.0272	0.0514	0.0569	0.2229	-0.0120	0.0171	-0.1266
44	-0.0468	-0.0215	-0.1279	-0.0755	0.1147	0.0779	-0.0246	0.0011
45	0.1151	-0.0384	-0.1353	0.0139	0.1490	-0.0916	0.0072	-0.0059
46	0.1549	0.0181	0.0373	0.1480	-0.1913	0.1270	0.2151	-0.0423
47	0.0076	-0.0268	0.1540	-0.0559	0.1222	0.0150	0.0158	0.1771
48	-0.0404	-0.0244	-0.0419	0.0054	0.1569	-0.0525	0.1240	-0.0749
49	-0.1225	-0.0854	0.1255	-0.0545	0.0700	0.1347	0.2512	0.0044
50	-0.1266	0.0466	0.0102	0.1261	0.0408	-0.0165	0.0546	-0.0010
51	-0.1490	-0.1447	-0.0902	0.0767	0.1315	-0.0352	-0.1301	-0.0604
52	0.0728	-0.2177	-0.0334	0.0917	0.0333	0.0254	-0.0275	0.0474
53	-0.0896	-0.0191	0.2771	-0.1290	0.1274	0.0866	-0.0154	0.0471
54	-0.0276	0.0685	0.1354	0.1033	-0.0502	0.0588	0.1169	-0.0503
55	0.0565	-0.0444	0.1004	0.1984	0.1667	0.0350	-0.0345	-0.0713
56	0.0719	0.1465	-0.1567	-0.2152	-0.0085	0.0346	0.0150	0.0718
57	0.0278	-0.2280	-0.1103	0.0805	0.0522	-0.0597	0.0830	0.0020
58	-0.1492	-0.0404	-0.0732	-0.0669	-0.2076	0.1090	-0.1291	0.0297
59	-0.0953	0.0405	0.0777	0.0424	-0.1445	0.0404	-0.0022	-0.0766
60	0.0011	-0.1006	0.0560	0.0075	0.0519	-0.0157	-0.1637	0.1065
61	-0.0593	0.1075	0.0316	-0.1733	-0.0861	0.0307	-0.0500	0.1210
62	-0.2188	0.1149	0.1072	-0.0970	0.1794	-0.0788	-0.3160	0.1234
63	-0.1598	0.1458	0.0452	-0.0340	-0.0020	0.0899	0.0764	-0.0488
64	-0.1938	0.0316	-0.0116	-0.1164	0.0207	-0.0325	-0.1230	-0.1064
65	1.0000	-0.0961	-0.1140	0.1001	0.0586	-0.2626	0.0730	0.0817
66	-0.0961	1.0000	0.2169	-0.1856	-0.1276	-0.1611	-0.0177	-0.0520
67	-0.1140	0.2169	1.0000	-0.2861	-0.0543	0.0154	0.0671	-0.0304
68	0.1001	-0.1856	-0.2861	1.0000	0.0029	-0.2794	0.1514	-0.0210
69	0.0586	-0.1276	-0.0543	0.0029	1.0000	-0.3259	-0.1526	-0.1250
70	-0.2626	-0.1611	0.0154	-0.2794	-0.3259	1.0000	0.0220	0.0393
71	0.0730	-0.0177	0.0671	0.1514	-0.1526	0.0220	1.0000	0.0105
72	0.0817	-0.0520	-0.0304	-0.0210	-0.1250	0.0393	0.0105	1.0000
73	0.0085	0.1152	0.1016	-0.0256	-0.0471	0.0719	0.0536	0.0570
74	0.0718	0.0554	0.0096	-0.0018	-0.0567	0.0847	0.0774	0.1605
75	0.0157	-0.0505	-0.0825	-0.0378	0.0382	0.0472	-0.0777	-0.0040
76	-0.0799	0.0353	0.1342	-0.0475	-0.1150	0.2392	0.0647	0.3287
77	-0.1367	0.0748	0.0764	-0.0917	-0.0322	0.1579	-0.0909	0.1206
78	-0.0846	-0.0337	-0.0010	-0.0169	-0.1449	0.2227	0.1274	0.1404
79	0.0217	0.0294	0.1504	0.1052	0.0430	-0.1431	0.2594	0.2221
80	0.0023	0.1586	0.2958	-0.1260	-0.0085	0.1984	0.2290	0.2224
81	0.0864	-0.0484	-0.0997	-0.0603	-0.0073	-0.0274	-0.0774	0.5615
82	-0.0153	0.0149	0.0718	-0.0930	-0.1210	0.1351	0.0903	0.0836
83	0.0014	-0.0675	0.0977	-0.1150	-0.0822	0.1420	0.2039	0.0322
84	-0.0551	0.0105	0.0120	0.0810	-0.0635	0.0185	0.1103	0.1216
85	-0.0260	-0.0219	0.0460	-0.1774	0.1286	0.1119	-0.0108	-0.0795
86	0.0790	0.1219	-0.0590	-0.2182	0.1109	0.1095	0.0849	-0.0093
87	0.0215	0.0747	0.1091	-0.1845	0.1621	0.1004	0.0445	0.0429
88	-0.0384	-0.0311	0.1590	-0.1272	-0.0407	0.1734	0.1346	0.0056
89	0.0565	-0.0103	0.0558	0.1107	0.0588	-0.1182	-0.1515	0.2404
90	0.0335	-0.0644	-0.1119	0.0203	0.0062	-0.0683	-0.1634	0.3149
91	-0.1280	-0.2733	-0.0683	0.0220	0.0618	0.0744	-0.0446	0.2920
92	0.2445	0.0166	0.1871	-0.0464	0.0142	-0.1387	0.1518	0.1643
93	-0.0600	-0.0982	0.0966	-0.2058	0.0565	0.1375	-0.0399	0.2516
94	0.0529	-0.0465	0.1631	0.0193	0.0965	-0.1104	-0.0248	0.0538
95	0.0923	-0.0669	0.1330	-0.0060	0.1118	-0.0647	-0.0399	0.0452

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        96   -0.1162      0.0773      0.0249      0.0326      0.0448      0.0091      0.0570     -0.0036
        97   -0.0162     -0.0472      0.2265     -0.0171     -0.0321      0.0157     -0.0033      0.0147
        98    0.1049      0.1613      0.1742     -0.0990      0.1162     -0.1231      0.0084     -0.0437
O.C.    99    0.0417     -0.0943      0.0504      0.1935      0.0826     -0.1245      0.0391      0.0134
       100   -0.0594      0.1449      0.0376      0.0746      0.0896      0.0462     -0.0632      0.1345
       101    0.0609      0.0445      0.1099     -0.0993     -0.0098     -0.1216     -0.0227      0.1447
       102   -0.1811      0.1656      0.3091      0.0591      0.0388     -0.0727      0.2103      0.0040
       103   -0.0574      0.1283      0.2709     -0.0037      0.0780     -0.0782      0.1529      0.0651
       104   -0.1555      0.0446      0.1296      0.0427     -0.0595     -0.1158      0.0246      0.0242
       105   -0.1287      0.0118      0.0765      0.0272      0.0605     -0.0894     -0.1239     -0.1232
       106    0.1444      0.0644     -0.0082     -0.0863     -0.0019     -0.0446     -0.1156      0.1130
       107   -0.1154      0.1151      0.1378     -0.2446      0.0759      0.2077     -0.1254      0.0365
       108   -0.0496      0.1078      0.2249     -0.0546     -0.0278      0.0372      0.1173      0.1118
       109   -0.0441     -0.1725      0.1263      0.0468      0.0170     -0.0009     -0.1178      0.1197
       110    0.0986     -0.0943     -0.2530      0.0237      0.0168      0.0259     -0.0119      0.2612
       111   -0.0638     -0.1088     -0.0799     -0.1026     -0.1227      0.0798      0.0049     -0.1522
       112    0.0437     -0.1567     -0.1199     -0.1247     -0.1523      0.1091     -0.0673      0.0834
       113   -0.0288     -0.0792      0.1451     -0.1128      0.0210      0.0384      0.0251     -0.1071
       114    0.0275      0.0359     -0.1204      0.0933     -0.0248     -0.0750     -0.0577      0.1995
       115   -0.0592      0.1259      0.0761      0.0122      0.0881      0.0436     -0.1243     -0.0601
       116    0.0552     -0.1238     -0.1132      0.0242     -0.0886     -0.0043      0.1520     -0.0705
       117    0.0693     -0.0535      0.0279      0.0749      0.3360     -0.2833      0.0335      0.0425
       118   -0.1987     -0.0044      0.0686     -0.1276      0.1008     -0.0076      0.2270      0.1737
       119   -0.0512     -0.0408      0.0402     -0.0081      0.2677     -0.1834      0.1294      0.1217
       120   -0.0957     -0.0081     -0.0936      0.0236      0.1319     -0.0696      0.0273      0.2004
       121   -0.1319      0.0540     -0.0277      0.1152     -0.0178     -0.0198      0.0203      0.1650
       122    0.0232     -0.0142     -0.0635     -0.0037      0.0658     -0.0633      0.0561      0.0720
       123   -0.0773      0.0109     -0.0755      0.0499      0.0745     -0.0594      0.0398      0.1694
       124   -0.0381      0.1069     -0.0631     -0.1229      0.1211     -0.0267     -0.0293      0.0659

             COL.        COL.        COL.        COL.        COL.        COL.        COL.        COL.
             73          74          75          76          77          78          79          80
       ROW

         1   -0.0396      0.1107     -0.2106      0.0158      0.1212      0.0163     -0.0453     -0.0514
         2   -0.1997     -0.0651     -0.2907     -0.1137     -0.0224      0.0446      0.0184      0.0646
         3   -0.1409      0.0087     -0.0985     -0.1932      0.0654     -0.1468     -0.0605     -0.0202
         4   -0.0537      0.0166     -0.1193      0.0107      0.1201      0.0616     -0.0965      0.0318
         5    0.0614     -0.1645      0.0050      0.0732      0.0951      0.1617      0.0109      0.1263
         6   -0.1217     -0.0734      0.0103      0.0154      0.0596      0.0549     -0.1459      0.0541
         7   -0.1172     -0.0620     -0.0777     -0.0611      0.0895      0.0585     -0.1745      0.0337
         8    0.0686     -0.1329     -0.0163      0.0266      0.1878      0.0295     -0.0513      0.1792
         9    0.2000     -0.0696     -0.0265      0.1098      0.0515      0.0925      0.0754      0.1690
        10    0.0777     -0.1190     -0.0669      0.0454      0.2311     -0.0899     -0.0455      0.0767
        11   -0.0182     -0.0573      0.0049     -0.0786      0.0476     -0.1766     -0.0148     -0.0192
        12   -0.0806     -0.1235      0.0843      0.0393     -0.0671     -0.0026     -0.0110      0.0615
        13    0.0198      0.0047     -0.0006      0.0454     -0.0275     -0.1425     -0.0396      0.0081
        14    0.2661     -0.1238     -0.1011      0.0497      0.0740      0.1203      0.1209      0.1361
        15    0.0102     -0.0159     -0.1015     -0.0343      0.0932     -0.0118     -0.1294      0.0157
        16   -0.1268      0.0441     -0.1670      0.0205     -0.0556     -0.0235      0.1009      0.0355
        17    0.0491      0.1600      0.0056      0.1361     -0.0757     -0.0990     -0.0050      0.0321
        18    0.2317      0.0263      0.1651      0.2453      0.1462      0.2107     -0.0058      0.2844
        19    0.2448      0.0346      0.1455      0.2418      0.1264      0.2162      0.0025      0.2559
        20    0.0136      0.0233     -0.0761      0.0399      0.0060      0.0728      0.0300      0.1370
        21    0.0232      0.1439      0.1332      0.0318     -0.0745     -0.0515     -0.0265      0.0607
        22   -0.0233     -0.1327     -0.1403      0.0904      0.1643      0.0597      0.0388     -0.0328
        23    0.0333     -0.1035     -0.0985      0.0343      0.1385     -0.0662      0.1387     -0.1192
        24   -0.1246     -0.1128      0.0113     -0.0452      0.0149     -0.0206     -0.0297     -0.0357
        25    0.0089      0.0492     -0.0500      0.0752      0.0524      0.0038      0.0696     -0.0891
        26    0.1096     -0.0313     -0.0948      0.0928      0.0709     -0.0262      0.1077     -0.1092
        27    0.0345     -0.1134     -0.1973      0.0270      0.0963      0.0328      0.1880     -0.0969
        28    0.1200      0.0440     -0.2161      0.1162      0.0493     -0.0180      0.1910     -0.0578
        29    0.0750      0.0175     -0.0547      0.1050      0.0698     -0.1466      0.0048     -0.1232
        30    0.0058     -0.0467     -0.0422      0.0336      0.0760     -0.1179      0.0710     -0.1354
        31    0.0191      0.0147     -0.0800      0.0956      0.0663     -0.1095      0.1469     -0.0951
        32   -0.1140     -0.0474     -0.0776     -0.1563      0.1374     -0.0650     -0.2064      0.0874
        33    0.1294      0.0694      0.1281      0.1773     -0.1475      0.0111      0.2346     -0.0231
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34	-0.0407	0.0237	-0.1150	-0.0559	0.0015	0.0184	-0.0738	-0.1054
35	-0.0146	0.2144	-0.0373	-0.0425	-0.0260	-0.1647	-0.1695	-0.0523
36	0.0089	0.1546	0.0472	-0.0279	0.0207	-0.2246	-0.1795	-0.0575
37	0.0973	-0.0738	0.1359	0.0316	0.1050	0.0928	-0.0471	0.1147
38	-0.0189	0.0880	-0.0236	-0.1176	0.0795	-0.2438	-0.2001	-0.0659
39	0.0969	-0.1047	-0.0245	-0.0247	0.2298	-0.0996	-0.1206	-0.0127
40	0.0398	-0.0367	0.0979	0.0076	-0.0425	-0.0776	0.0542	0.1997
41	-0.0914	-0.0190	-0.1345	-0.0509	-0.0014	0.0274	0.0963	0.1424
42	-0.0587	0.0786	-0.2954	-0.0637	0.0649	-0.0200	0.1480	0.1094
43	-0.0341	-0.1225	-0.0274	-0.0109	-0.0065	0.0884	0.2129	0.0445
44	0.0013	-0.1086	-0.0861	-0.0397	0.1120	0.0862	-0.0105	0.0033
45	-0.0879	-0.0032	-0.1662	-0.1127	0.0715	-0.1641	-0.0728	-0.1420
46	-0.0178	-0.0552	0.3119	0.0695	-0.1633	0.1344	0.0772	0.0772
47	0.1872	0.0448	0.0710	0.0831	-0.0664	-0.0293	0.1239	-0.0793
48	0.0495	-0.0965	0.0217	0.1919	0.0917	0.1018	0.2090	0.0685
49	0.0193	-0.0842	-0.1566	0.0443	0.2243	0.1916	0.0010	0.0142
50	0.0314	-0.1018	0.0317	0.0413	0.1406	0.1155	-0.0186	-0.0874
51	-0.0736	-0.0070	-0.0205	0.0437	-0.0090	0.0267	-0.0673	0.0046
52	-0.0775	0.0483	0.0187	-0.0664	-0.0526	-0.0240	-0.0631	-0.1362
53	0.1994	0.0208	0.2017	0.1446	0.0201	-0.0084	0.0727	0.2273
54	0.1313	0.0101	0.0735	0.2978	0.0246	0.0110	0.1147	0.0751
55	0.1265	-0.0153	-0.0432	0.1675	0.0275	0.1189	0.2695	0.0519
56	0.0870	0.1148	0.1769	-0.0096	-0.1839	0.2317	0.0007	0.7104
57	-0.1192	0.0556	0.0034	-0.1328	0.0156	-0.1497	-0.2034	-0.0730
58	0.0591	-0.0832	0.0717	0.1124	0.0472	0.0847	0.0034	0.0248
59	0.0718	0.0232	0.0108	-0.0465	-0.0109	0.0528	-0.0831	-0.0561
60	0.0614	-0.0169	0.0232	-0.0475	-0.0510	-0.1361	0.0512	-0.0636
61	-0.0992	-0.0265	0.1118	-0.1405	-0.1537	-0.1171	-0.0767	-0.0445
62	0.0377	-0.1915	0.0587	-0.0873	-0.0624	-0.0020	0.0604	0.0248
63	-0.0537	-0.0219	-0.0866	0.0030	0.0419	0.0711	0.0147	0.0763
64	-0.0390	-0.0325	-0.0580	-0.1903	0.0050	-0.0510	-0.0963	-0.2266
65	0.0085	0.0718	0.0382	-0.0799	-0.1357	-0.0846	0.0217	0.0023
66	0.1152	0.0594	-0.0505	0.0383	0.0748	-0.0337	0.0994	0.1536
67	0.1014	0.0096	-0.0525	0.1392	0.0769	-0.0010	0.1504	0.2958
68	-0.0256	-0.0018	-0.0378	-0.0475	-0.0817	-0.0169	0.1052	-0.1260
69	-0.0471	-0.0567	0.0382	-0.1150	-0.0322	-0.1449	0.0430	-0.0065
70	0.0719	0.0847	0.1972	0.2392	0.1579	0.2227	-0.1431	0.1954
71	0.0536	0.0774	-0.0777	0.0847	-0.0908	0.1374	0.2594	0.2790
72	0.5570	0.1605	-0.0046	0.2287	0.1208	0.1404	0.3321	0.3334
73	1.0000	0.1155	0.2230	0.7090	0.1471	0.3443	0.5061	0.4059
74	0.1155	1.0000	-0.0958	0.2070	-0.4708	-0.2084	0.0701	0.1047
75	0.2230	-0.0958	1.0000	0.2429	-0.2743	0.0037	-0.0999	0.0475
76	0.7090	0.2070	0.2429	1.0000	0.1917	0.4275	0.4137	0.5083
77	0.1471	-0.4708	-0.2743	0.1917	1.0000	0.1439	-0.1136	0.0044
78	0.3443	-0.2084	0.0037	0.4275	0.1439	1.0000	0.1672	0.4468
79	0.5061	0.0701	-0.0999	0.4137	-0.1136	0.1672	1.0000	0.1974
80	0.4059	0.1047	0.0475	0.5083	0.0044	0.4468	0.1974	1.0000
81	0.6237	0.1444	0.0697	0.4136	-0.0193	0.2059	0.2909	0.2274
82	0.0587	0.0739	-0.1623	0.0568	0.0408	0.2205	0.1004	0.0031
83	0.0392	0.1266	-0.1174	0.0538	-0.0222	0.0746	0.0711	-0.0374
84	0.1480	0.1332	-0.0410	0.2029	0.0024	0.1895	-0.0666	0.0282
85	0.1406	0.0149	-0.0154	0.0531	0.1126	0.2602	-0.0127	0.0716
86	-0.0472	0.1459	-0.1102	-0.0745	0.0104	0.0338	-0.0179	0.0644
87	0.0015	0.2337	-0.1512	-0.0239	-0.0465	0.1759	-0.0039	0.1272
88	-0.0631	0.1534	-0.1075	-0.0486	0.0227	0.1590	-0.1045	0.0459
89	0.0159	-0.0442	-0.1057	-0.1123	0.1567	-0.0667	-0.0148	0.0167
90	0.0326	0.0252	0.0461	-0.0087	-0.0400	-0.1119	-0.1162	0.0095
91	0.2473	-0.1855	0.0473	0.0758	0.2201	0.1537	-0.0078	0.1544
92	0.0830	0.1933	-0.0585	0.0496	0.0153	-0.1912	0.1057	-0.0379
93	0.3087	0.0612	0.0154	0.2377	0.1190	-0.0127	0.2237	0.0334
94	0.0655	-0.0086	-0.1008	0.0326	0.1361	0.0860	0.0315	0.0933
95	0.0551	0.0332	-0.0447	0.0214	0.0525	0.0237	0.0173	0.1071
96	-0.0663	0.0172	-0.0374	-0.1079	0.0893	-0.1087	-0.1951	0.0967
97	0.0327	0.1030	-0.0087	0.0963	-0.0038	0.0444	-0.0192	0.1776
98	0.0775	0.1464	0.0664	0.0943	-0.0824	-0.0511	0.0513	0.0518
99	0.0164	0.1347	-0.0847	0.0224	-0.2473	0.0504	0.1279	0.0428
100	0.0107	-0.0171	-0.1252	-0.1253	0.1352	-0.1274	0.0087	-0.1389
101	0.0406	-0.0497	-0.1277	-0.1626	0.2057	-0.1277	-0.0716	-0.0278

```
OC.
      102      0.1023      0.1416      0.0442      0.1316      0.0119      0.0645     -0.0322      0.1850
      103      0.0792      0.0612     -0.0179      0.1019     -0.0191      0.0184      0.0824      0.1113
      104      0.0295     -0.0272      0.1047      0.0404      0.0807     -0.1434      0.0535     -0.0607
      105     -0.0182     -0.1437     -0.0415     -0.1204     -0.1546      0.0203      0.2093      0.0377
      106      0.0124     -0.0802     -0.0116     -0.0115      0.0919     -0.0087     -0.1173      0.1142
      107      0.1364      0.0649     -0.0689      0.1786      0.1403      0.0588      0.0812      0.1569
      108      0.0643     -0.0296     -0.0905      0.0881      0.1553      0.0437     -0.0938      0.1994
      109      0.1689     -0.1366      0.0046      0.0840      0.2276     -0.0342      0.0768      0.0439
      110      0.2175     -0.0650      0.1296      0.0568      0.1033      0.0937      0.0708      0.0458
      111     -0.1855     -0.1963      0.0738     -0. 411     -0.0477     -0.0503     -0.0055     -0.1244
      112      0.0353     -0.0472      0.0460      0.0235      0.0103      0.0166     -0.0410     -0.1205
      113     -0.1243      0.2176     -0.0793     -0.0179      0.0228     -0.1467     -0.0659     -0.0288
      114      0.1123     -0.0141      0.1208      0.0466     -0.2052      0.1047      0.1764      0.0177
      115      0.1266     -0.1227      0.0062      0.0275      0.1575      0.0761      0.0136      0.0669
      116     -0.0862     -0.1835     -0.0554     -0.0617      0.1057      0.0009     -0.1564     -0.0715
      117      0.0263     -0.0935     -0.0601     -0.0267      0.0753     -0.0325      0.0939      0.0467
      118      0.2412      0.0470     -0.2640      0.2234      0.2529      0.0658      0.2386      0.1777
      119      0.1247     -0.0353     -0.1733      0.0927      0.1749      0.0064      0.1730      0.1241
      120      0.1505      0.0502      0.0366      0.1126     -0.0847      0.0280      0.1323      0.0966
      121      0.1763      0.1320     -0.0328      0.1754     -0.0333      0.0679      0.0698      0.1260
      122      0.0884      0.1739      0.0163      0.1005     -0.1731     -0.0559      0.0934      0.1225
      123      0.1554      0.1348      0.0090      0.1474     -0.1124      0.0144      0.1214      0.1532
      124      0.0571     -0.1163      0.0925      0.0672      0.1099      0.0286     -0.0312      0.0927

             COL.        COL.        COL.        COL.        COL.        COL.        COL.        COL.
             81          82          83          84          85          86          87          88
      ROW

        1     -0.0707     -0.0161     -0.0792      0.1150      0.1463      0.0744      0.1002      0.0214
        2     -0.1030      0.2373      0.1517      0.0745     -0.0020      0.2228      0.1311      0.0152
        3     -0.0996      0.0988      0.0763      0.0291      0.0347      0.1103      0.1756      0.0799
        4     -0.0376      0.0461     -0.0415      0.1160      0.0449     -0.0048      0.0309     -0.0411
        5     -0.0414      0.1303      0.0502      0.1893      0.0495      0.0698      0.1092      0.1404
        6     -0.0860     -0.0733      0.0094      0.0893      0.0727      0.0336     -0.0240      0.1384
        7     -0.0828     -0.0527      0.0226      0.0963      0.1319      0.0382      0.0559      0.1469
        8      0.0484     -0.0344      0.0114      0.0021     -0.1024     -0.1443     -0.0316     -0.0784
        9      0.1518      0.0668      0.0743      0.1017     -0.0709     -0.0806     -0.0106      0.0001
       10      0.0549     -0.0702     -0.0030     -0.0066     -0.1864     -0.1635     -0.0424     -0.0629
       11      0.0240     -0.1946     -0.1324      0.0071     -0.0949     -0.2115     -0.1486     -0.0426
       12     -0.1145      0.0934      0.1540      0.1785     -0.0578      0.1625      0.0793     -0.0976
       13      0.0864      0.1285      0.2116      0.2716     -0.0801      0.0733      0.0014     -0.0751
       14      0.1741     -0.0844     -0.1040      0.1015      0.0399     -0.0614      0.0221      0.0400
       15      0.1308     -0.0097     -0.0253      0.1377     -0.1564     -0.0894      0.0430      0.0939
       16     -0.0017     -0.0365     -0.1018      0.0490     -0.0453     -0.0191     -0.0730     -0.1571
       17      0.0191      0.0112      0.0947      0.1581      0.0146      0.2000      0.1573      0.0585
       18      0.1822      0.1164      0.1095      0.0713      0.0631      0.1016      0.0636      0.1044
       19      0.1752      0.1021      0.1015      0.0774      0.0569      0.0554      0.0455      0.0559
       20     -0.0643      0.1804      0.0476      0.0466      0.0706      0.1574      0.1636      0.1608
       21      0.0164      0.1014     -0.0199      0.0467     -0.1401      0.0785     -0.0504      0.0670
       22     -0.1079     -0.1811     -0.2138      0.0517     -0.1442     -0.1985     -0.0782     -0.0792
       23      0.0688     -0.1180     -0.0878     -0.0666     -0.2387     -0.1640     -0.1711     -0.1155
       24     -0.0516      0.0103      0.0025     -0.0242     -0.0670      0.0828      0.0045      0.1730
       25     -0.0523      0.0370     -0.0538      0.2172     -0.0075     -0.0677     -0.1022     -0.0480
       26      0.0052      0.0719      0.0466      0.2135     -0.0926      0.0428      0.0455      0.1507
       27      0.0869      0.2078      0.0495      0.1199     -0.1243      0.0105     -0.0018      0.2218
       28      0.1471      0.1697      0.0567      0.2055     -0.0266      0.1788      0.0722      0.2216
       29      0.0219      0.1066      0.1262      0.2519      0.0089      0.0575     -0.0959     -0.0261
       30      0.0760      0.1290      0.1278      0.2380     -0.0050      0.0119     -0.0446      0.0264
       31      0.1276      0.1160      0.1238      0.1686      0.0341      0.0847     -0.0050      0.0638
       32     -0.0805      0.0556      0.0485      0.1166      0.0652      0.0754      0.1354      0.0579
       33     -0.0453     -0.0651     -0.0187     -0.0641     -0.1384     -0.1180     -0.1238     -0.1215
       34      0.3009      0.0010     -0.0761     -0.1579      0.1048      0.0857     -0.0546      0.0975
       35     -0.0098     -0.0320      0.0093      0.0096     -0.1388      0.0531     -0.0416     -0.0224
       36     -0.0236     -0.0556      0.0068     -0.0196     -0.1059      0.0339     -0.0919      0.0701
       37      0.1499      0.0682     -0.0624      0.0723     -0.0679      0.0825      0.0626     -0.0901
       38     -0.0184     -0.0437      0.0516      0.0192     -0.0865      0.0470     -0.0021      0.1006
       39      0.0909     -0.0685      0.0706      0.1013      0.0455     -0.0254     -0.0199      0.0212
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40	-0.0202	0.1147	0.1936	0.0331	-0.1264	-0.0292	0.0867	0.1065
41	-0.1606	0.0598	0.0539	0.1610	0.0199	-0.0405	0.2353	0.1161
42	-0.0463	0.1615	0.0850	0.0979	0.0507	0.1039	0.2619	0.0956
43	-0.1108	0.0259	0.0117	0.0040	0.1272	-0.0489	0.1016	0.0432
44	0.1012	0.2450	0.1945	0.1429	0.0408	0.1231	0.1193	0.1044
45	-0.1148	0.0601	-0.0076	0.1346	-0.1026	-0.0667	0.0555	-0.0115
46	-0.1953	-0.1787	-0.0911	-0.0042	0.0115	-0.0217	-0.0150	-0.0410
47	0.2765	0.1552	0.0678	0.1744	-0.0137	-0.1049	-0.0195	-0.1719
48	-0.0178	-0.1324	-0.0556	0.0078	0.1566	-0.1082	0.0476	-0.0200
49	-0.0691	0.0443	0.1047	0.1280	0.0956	0.0403	0.1721	0.1035
50	-0.1560	0.0712	0.0100	0.1606	0.1340	0.0228	0.1197	0.0271
51	-0.0520	0.0150	0.0430	0.0836	-0.1478	-0.0671	-0.0280	-0.1152
52	-0.0701	0.1155	0.0705	0.1627	-0.0725	-0.0526	0.0642	0.0505
53	0.0239	-0.0436	-0.0288	-0.1169	0.1014	-0.0498	0.0414	-0.0069
54	-0.0431	-0.0294	0.0523	0.1152	0.0110	0.0427	-0.0142	-0.0605
55	0.0231	0.0649	0.0601	-0.0391	0.0732	0.0303	-0.0079	[illegible]
56	0.1588	-0.1035	0.0563	-0.0459	0.1335	0.1268	0.0336	[illegible]
57	-0.0584	-0.1360	-0.1736	0.0309	-0.0524	-0.0545	0.0509	[illegible]
58	0.1258	-0.0717	-0.0397	0.0086	-0.0209	0.0216	-0.1765	[illegible]
59	-0.0093	0.1363	0.1404	0.1216	0.2066	0.0277	0.0920	0.1654
60	0.0434	-0.0613	-0.1211	-0.1691	-0.0664	-0.0221	-0.1541	0.0446
61	-0.0074	-0.1725	-0.1355	-0.2355	-0.0620	-0.0177	-0.0424	-0.0447
62	0.1775	0.0676	-0.0420	-0.0792	-0.0675	-0.0721	-0.0402	-0.1161
63	-0.1649	-0.1457	-0.1340	-0.1402	0.1141	-0.0302	0.1231	0.1276
64	-0.0551	-0.0624	-0.0136	-0.0418	0.0669	0.0144	0.2163	0.0451
65	0.0864	-0.0153	0.0014	-0.0551	-0.0360	0.0780	0.0215	-0.0314
66	-0.0488	0.0199	-0.0675	0.0105	-0.0219	0.1219	0.0747	-0.0311
67	-0.0597	0.0711	0.0977	0.0120	0.0460	-0.0590	0.1061	0.1440
68	-0.0603	-0.0690	-0.1150	0.0810	-0.1234	-0.2182	-0.1845	-0.1272
69	-0.0073	-0.1210	-0.0927	-0.0835	0.1266	0.1100	0.1431	-0.0007
70	-0.0274	0.1251	0.1420	0.0185	0.1119	0.1095	0.1004	0.1734
71	-0.0774	0.0563	0.0935	0.1103	-0.0108	0.0649	0.0443	0.1650
72	0.5615	0.0836	0.0322	0.1216	-0.0798	-0.0447	0.0450	[illegible]
73	0.0237	0.0587	0.0392	0.1480	0.1406	-0.0472	0.0015	-0.0631
74	0.1944	0.0719	0.1366	0.1332	0.0149	0.1459	0.2327	0.1527
75	0.0487	-0.1823	-0.1174	-0.0410	-0.0194	-0.1102	-0.1512	-0.1078
76	0.4136	0.0568	0.0538	0.2029	0.0531	-0.0745	-0.0236	-0.0466
77	-0.0193	0.0408	-0.0222	0.0036	0.1126	0.0104	-0.0465	0.0227
78	0.2080	0.2705	0.0746	0.1595	0.2802	0.0236	0.1769	0.1520
79	0.2909	0.1004	0.0711	-0.0566	-0.0127	-0.0179	-0.0629	-0.1040
80	0.2273	0.0031	-0.0374	0.0252	0.0716	0.0644	0.1273	0.0460
81	1.0000	0.0719	0.0277	0.0367	0.0273	-0.0384	-0.0434	-0.0250
82	0.0719	1.0000	0.7743	0.4542	0.2055	0.4214	0.3390	0.3405
83	0.0277	0.7743	1.0000	0.5129	0.3256	0.4435	0.3748	0.3853
84	0.0367	0.4542	0.5128	1.0000	0.1065	0.1787	0.3728	0.3356
85	0.0273	0.2055	0.3256	0.1069	1.0000	0.4036	0.2910	0.2846
86	-0.0384	0.4214	0.4435	0.1787	0.4039	1.0000	0.5649	0.4446
87	-0.0434	0.3360	0.3748	0.3729	0.2910	0.5649	1.0000	0.4202
88	-0.0250	0.3645	0.3893	0.3306	0.2868	0.4045	0.4202	1.0000
89	-0.0269	-0.0135	-0.0026	-0.1275	-0.0654	-0.1712	-0.1275	-0.0003
90	0.0726	-0.0591	-0.1113	-0.1128	-0.1810	0.0656	0.0401	-0.0351
91	0.2277	0.0142	0.0594	0.1453	0.1521	0.0012	-0.0109	0.1353
92	0.0256	0.0263	0.1015	0.1277	-0.0454	0.0754	0.1747	0.0744
93	0.2897	-0.0770	-0.0471	0.0284	-0.1536	-0.0404	-0.0254	-0.0801
94	-0.1306	0.1472	0.0025	0.0554	-0.0176	-0.0181	0.1229	0.0353
95	-0.1283	0.0137	0.0062	0.0025	0.0249	-0.0404	0.0738	0.0178
96	-0.1792	0.1284	0.1336	0.1273	0.1084	0.0328	0.0739	0.0713
97	-0.0654	-0.0404	-0.0414	0.1473	-0.0277	-0.0914	0.1107	0.1413
98	-0.0378	-0.0421	-0.0415	0.0045	0.0449	-0.0631	0.0920	-0.0411
99	0.0316	0.0715	-0.0140	-0.0100	-0.0138	0.0104	0.0219	0.0040
100	0.0636	0.0525	-0.0747	0.1101	-0.0737	0.0557	-0.0327	-0.0444
101	0.0373	0.1913	0.1749	-0.0191	-0.0064	0.1548	0.0134	0.1472
102	0.0054	-0.0678	-0.0496	0.1365	-0.0464	-0.0585	0.1563	0.1035
103	0.0042	0.0653	-0.0539	0.1057	-0.0978	0.0202	0.2095	0.2374
104	-0.1583	-0.1140	-0.0855	0.0593	-0.1014	-0.0716	0.1103	0.0851
105	-0.1051	-0.1446	-0.1768	-0.1047	-0.1500	-0.0657	0.0813	-0.1207
106	-0.0266	0.0201	0.0906	0.1965	0.0953	0.1018	0.1355	0.0472
107	-0.1496	0.1463	0.2667	0.1291	0.2330	0.2741	0.2750	0.1291

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108    0.0454    0.0112   -0.0550    0.1293    0.0670    0.0250    0.1424    0.1856
109    0.0647    0.0480    0.1211    0.0068   -0.0116   -0.0902    0.0531    0.0720
110    0.3100   -0.1482   -0.4157   -0.2673   -0.1412   -0.1243   -0.0960   -0.1689
111   -0.2767   -0.2726   -0.3054   -0.2011   -0.1917   -0.1895   -0.1757   -0.1553
112    0.1164    0.1768    0.1117    0.1475   -0.1125   -0.0079   -0.0760    0.0949
113   -0.1314    0.0158    0.1181    0.0738    0.1571    0.1710    0.2095    0.2196
114    0.2177    0.1205    0.0839    0.0350   -0.1224   -0.1532   -0.1994   -0.2045
115   -0.0517   -0.1589   -0.2599   -0.1472   -0.1059   -0.0690    0.0191   -0.1583
116   -0.0600   -0.0451   -0.0437   -0.0228    0.0355    0.0238   -0.0466    0.0547
117    0.0114    0.1308    0.1420    0.2269   -0.0222    0.0555    0.1341    0.1111
118    0.1494    0.1432    0.0364    0.1656   -0.0219    0.1117    0.2081    0.2019
119    0.2504    0.1211    0.0717    0.2109   -0.0489    0.0875    0.1664    0.1578
120    0.0834    0.2027    0.1915    0.3365   -0.0333   -0.0163    0.0934    0.0679
121    0.0500    0.1336    0.0497    0.1979   -0.0733   -0.0431    0.0670    0.0514
122    0.1106    0.1981    0.2055    0.2640   -0.1541    0.0621    0.1221    0.0281
123    0.0940    0.2057    0.1736    0.2079   -0.0991    0.0016    0.1056    0.0566
124    0.0143   -0.1002   -0.0444    0.0899   -0.0619    0.1581    0.0038    0.0262

       COL.      COL.      COL.      COL.      COL.      COL.      COL.      COL.
ROW    89        90        91        92        93        94        95        96

  1   -0.1665   -0.1891    0.0306    0.0142    0.0285    0.0242    0.0507    0.1592
  2   -0.1019   -0.2384   -0.2452   -0.0593    0.0477    0.1036    0.0477    0.0276
  3    0.0690   -0.0034   -0.0132    0.2760   -0.1107   -0.0207   -0.1107    0.0967
  4    0.2429   -0.0707   -0.0908    0.1371    0.0639    0.0760    0.0639    0.1101
  5   -0.1737   -0.0954    0.0536   -0.0934   -0.1819   -0.0497   -0.0557    0.0473
  6   -0.0082   -0.0168    0.0860   -0.0385   -0.0035   -0.0635   -0.0783   -0.0663
  7    0.0563    0.0026    0.0934   -0.0547   -0.0228   -0.0055   -0.0228   -0.0144
  8    0.1038   -0.0925    0.2369   -0.0655    0.0283    0.1361    0.1390    0.2151
  9    0.1521    0.1441    0.2549    0.1610    0.0603    0.0274    0.0603    0.2549
 10    0.1176   -0.0355    0.2005    0.0061    0.1073    0.1011    0.1073    0.1334
 11    0.1438    0.1059    0.2289   -0.0155    0.0415   -0.0776   -0.0271    0.0866
 12   -0.0882    0.0353   -0.0475    0.0265   -0.0319   -0.0328   -0.0710    0.0538
 13    0.0502   -0.0787    0.0837    0.2050    0.1040   -0.0362    0.0514    0.1696
 14    0.0627    0.1655    0.2729    0.1334    0.1473    0.1334    0.0945    0.1570
 15    0.2186    0.2316    0.2130    0.1557    0.1191    0.1244    0.0666    0.2497
 16    0.0489   -0.0616   -0.0824   -0.0597   -0.0127   -0.0048   -0.0518    0.0726
 17   -0.0138   -0.0284    0.0933    0.1396    0.2233   -0.0698   -0.0092   -0.0048
 18    0.0120    0.1067    0.1371    0.0391    0.0220   -0.0678   -0.0964   -0.0576
 19    0.0374    0.1163    0.1470    0.0578    0.0159   -0.0714   -0.0980   -0.0725
 20   -0.0933    0.1754   -0.0875   -0.1157   -0.2147    0.0794   -0.0513    0.1003
 21   -0.0657    0.0723   -0.1227   -0.1014   -0.0279   -0.0372   -0.0279    0.1278
 22   -0.0255   -0.0525    0.0246    0.0547    0.1154    0.0744    0.0474    0.0588
 23    0.1348   -0.0489   -0.1027    0.1084    0.0835   -0.1189   -0.1785   -0.1164
 24   -0.2244   -0.1329    0.0409   -0.1591    0.1238   -0.0674   -0.0341    0.0281
 25    0.0109   -0.1075    0.0516   -0.1318   -0.1411   -0.0046    0.0200   -0.0718
 26   -0.0049    0.0024    0.0448   -0.0034   -0.0208    0.0463    0.1284   -0.1712
 27   -0.0387    0.0009    0.0628   -0.0497    0.0210    0.0827    0.0792   -0.1152
 28   -0.0691    0.0288   -0.0336    0.1179   -0.0338   -0.0034    0.0280   -0.1405
 29   -0.0048    0.0256   -0.0214   -0.0430   -0.1193   -0.0606   -0.0680   -0.0033
 30   -0.0526   -0.0344    0.0282   -0.0258   -0.1025   -0.0972   -0.1025   -0.0346
 31   -0.0203   -0.0245    0.0393    0.0896   -0.1121   -0.1267   -0.0871   -0.0677
 32    0.0097   -0.0572    0.1830    0.1222   -0.0180    0.0810    0.1269    0.2246
 33    0.1227    0.1518   -0.0937   -0.0620    0.0625    0.0456   -0.0101   -0.0587
 34   -0.2384   -0.1268   -0.1407   -0.1861   -0.1263   -0.3124   -0.3015   -0.2341
 35    0.0566    0.0557   -0.0006    0.1349    0.1463    0.1709    0.0673    0.0931
 36    0.1593    0.1206    0.0739    0.2583    0.1703    0.2395    0.2675    0.2111
 37   -0.0843   -0.0753    0.1734   -0.0074    0.1212    0.1296    0.0226   -0.1020
 38    0.1946    0.0592    0.1310    0.2131    0.2253    0.1760    0.2442    0.2828
 39    0.1618    0.0071    0.1611    0.0357    0.1912    0.1179    0.1701    0.1775
 40    0.0171    0.0173   -0.0798    0.0663    0.0292    0.0246   -0.0093    0.0118
 41    0.0665   -0.1485   -0.0445    0.1027   -0.0760   -0.0275   -0.0601    0.1214
 42   -0.0223   -0.1148   -0.0725    0.1138   -0.1013   -0.0367   -0.1013    0.1425
 43    0.0530   -0.2476   -0.0966   -0.0029   -0.0438   -0.0623   -0.0696    0.0163
 44    0.0866   -0.0077    0.1315    0.1491    0.0964    0.0793    0.0517    0.0120
 45    0.1062    0.0481    0.0454    0.2493    0.1281    0.0989    0.0225    0.1065
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46	-0.1209	-0.1758	-0.2251	0.0957	-0.1854	-0.1337	0.0339	-0.1584
47	-0.0685	-0.2439	-0.0675	-0.0129	0.2092	0.0520	-0.1185	-0.0960
48	-0.0840	-0.1384	0.0960	0.0892	-0.0144	0.0124	0.0104	-0.2567
49	-0.0441	-0.2328	0.1163	0.0477	0.0648	0.0189	0.0061	-0.0550
50	0.0024	-0.0483	0.0849	0.1104	-0.1457	-0.0240	-0.0173	-0.1231
51	0.1442	0.0493	0.0352	0.0910	-0.0066	-0.1461	-0.0056	-0.1613
52	0.1422	0.1340	-0.0951	0.1487	-0.0639	0.0451	0.0277	0.0578
53	0.0552	-0.0068	-0.0266	-0.0048	0.1705	0.1886	0.2455	0.2038
54	-0.1673	0.0994	0.0353	0.0446	0.0329	-0.1694	-0.1693	-0.0950
55	-0.0561	-0.0066	0.1401	-0.0010	-0.0078	0.0055	0.0146	-0.0997
56	-0.0527	-0.0646	-0.1135	-0.1803	-0.0163	-0.0748	-0.0369	-0.0688
57	-0.1360	0.0740	0.1167	-0.0319	0.0290	-0.0035	-0.0030	0.0605
58	-0.1494	-0.0774	0.0390	-0.1247	0.0218	-0.1172	-0.0022	-0.2191
59	-0.0616	-0.1476	-0.0243	-0.0741	-0.1127	-0.0220	0.0993	0.0723
60	-0.0767	0.0916	-0.0562	-0.0431	0.0344	0.0266	0.0704	-0.1441
61	0.1062	0.0392	-0.1273	-0.1411	-0.0806	-0.2359	-0.2680	-0.1715
62	-0.0249	-0.0461	-0.0559	-0.1849	-0.0537	-0.0404	0.0055	-0.0252
63	-0.0181	-0.0660	-0.1811	-0.1774	-0.1213	-0.0082	0.0258	-0.0249
64	-0.0762	-0.1050	-0.1497	-0.1996	0.0762	-0.0230	-0.1156	-0.0627
65	0.0565	0.0335	-0.1280	0.2445	-0.0990	0.0529	0.0923	-0.1162
66	-0.0103	-0.0544	-0.2733	0.0166	-0.0982	-0.0465	-0.0669	0.0773
67	0.0558	-0.1119	-0.0683	0.1871	0.0966	0.1631	0.1330	0.0249
68	0.1107	0.0302	0.0220	-0.0464	-0.2058	0.0193	-0.0060	0.0226
69	0.0588	0.0062	0.0618	0.0142	0.0565	0.0965	0.1119	0.0449
70	-0.1142	-0.0683	0.0748	-0.1387	0.1375	-0.1104	-0.0647	0.0091
71	-0.1515	-0.1634	-0.0804	0.1518	-0.0300	-0.0748	-0.0399	0.0570
72	0.2465	0.3149	0.2930	0.1643	0.2535	0.0538	0.0452	-0.0036
73	0.0159	0.0226	0.2423	0.0830	0.3087	0.0655	0.0551	-0.0663
74	-0.0442	0.0252	-0.1855	0.1937	0.0612	-0.0086	0.0322	0.0172
75	-0.1352	0.0951	0.0473	-0.0585	0.0154	-0.1008	-0.0447	-0.0374
76	-0.1132	-0.0087	0.0758	0.0496	0.2277	0.0326	0.0214	-0.1079
77	0.1567	-0.0400	0.2201	0.0153	0.1180	0.1361	0.0525	0.0893
78	-0.0667	-0.1119	0.1537	-0.1912	-0.0127	0.0860	0.0237	-0.1097
79	-0.0148	-0.1162	-0.0078	0.1057	0.2237	0.0315	0.0173	-0.1851
80	0.0167	0.0089	0.1844	-0.0379	0.0334	0.0932	0.1071	0.0967
81	-0.0209	0.0726	0.2277	0.0256	0.2897	-0.1306	-0.1283	-0.1782
82	-0.0135	-0.0591	0.0142	0.0263	-0.0770	0.1422	0.0137	0.1314
83	0.0026	-0.1113	0.0594	0.1015	-0.0471	0.0035	0.0082	0.1334
84	-0.1275	-0.1125	0.1453	0.1277	0.0386	0.0554	0.0025	0.1273
85	-0.0154	-0.1510	0.1821	-0.0454	-0.1536	-0.0176	0.0249	0.1054
86	-0.1212	0.0656	0.0012	0.0754	-0.0404	-0.0181	-0.0404	0.0326
87	-0.1375	0.0601	-0.0109	0.1767	-0.0254	0.1228	0.0738	0.0739
88	-0.0903	-0.0351	0.1333	0.0743	-0.0591	0.0353	0.0135	0.0713
89	1.0000	0.3210	0.2051	0.2203	0.2029	0.1940	0.2626	0.3190
90	0.3210	1.0000	0.2138	0.2829	0.0486	0.0741	-0.0129	0.1153
91	0.2051	0.2138	1.0000	0.0668	0.1902	0.1626	0.1301	0.2308
92	0.2203	0.2829	0.0668	1.0000	0.0672	0.1044	0.0057	0.1993
93	0.2029	0.0486	0.1902	0.0672	1.0000	0.2033	0.2004	-0.0227
94	0.1940	0.0741	0.1626	0.1044	0.2033	1.0000	0.7672	0.4296
95	0.2626	-0.0129	0.1301	0.0057	0.2004	0.7672	1.0000	0.3682
96	0.3190	0.1153	0.2308	0.1993	-0.0227	0.4296	0.3682	1.0000
97	0.2557	0.1166	0.3063	0.1131	0.3200	0.6352	0.6159	0.2965
98	0.1504	-0.0707	0.0022	0.3273	-0.0735	0.0760	0.0639	0.2108
99	0.0959	0.0510	-0.0150	0.0017	0.0860	0.3120	0.2974	0.0901
100	-0.0202	0.1048	0.0826	0.2319	0.0561	-0.0386	-0.1553	0.0672
101	0.1882	0.2091	0.1651	0.1574	-0.0120	0.0879	-0.0120	0.2426
102	0.0451	0.0927	0.0266	0.1729	-0.1087	-0.0110	-0.0092	0.1153
103	0.0749	0.0186	-0.0315	0.1872	0.0698	0.3987	0.3778	0.3716
104	0.1086	0.1576	0.0375	0.2007	-0.1305	-0.0421	0.1549	0.0922
105	-0.1330	0.1659	-0.0961	-0.0155	-0.0271	-0.0051	-0.0271	-0.2152
106	0.0478	0.1556	0.1191	0.4014	-0.0995	0.0121	0.0221	0.3232
107	0.0030	-0.0604	0.0243	0.1380	0.0425	0.1398	0.1388	0.2463
108	0.1736	0.0959	0.0659	0.2418	0.0737	0.0678	0.0737	0.2432
109	0.2683	0.2360	0.2619	0.0756	0.1699	0.1332	0.1047	0.0823
110	0.1670	0.1972	0.1281	0.2212	0.0860	0.0884	0.0860	0.1676
111	0.1356	0.0790	0.0159	0.0593	0.1914	0.0249	0.0370	-0.0370
112	0.0260	-0.1305	-0.0157	-0.0289	0.1345	-0.0949	-0.0649	-0.1696
113	-0.0853	-0.0407	-0.1155	0.1380	-0.1012	-0.0088	0.0287	0.0232

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114	0.0515	0.0585	0.0432	-0.1104	-0.0957	-0.0776	-0.1643	-0.0140
115	0.0657	-0.0827	-0.1108	-0.1166	0.0879	-0.0065	0.0879	-0.1719
116	-0.0058	0.0522	0.2045	0.0553	0.1963	0.1232	0.1036	0.1376
117	0.0964	-0.1531	0.1608	0.0424	0.1116	0.1240	0.0047	0.1065
118	0.1367	0.0437	0.2132	0.2902	0.2609	0.1269	-0.0356	0.1456
119	0.1302	-0.0745	0.1994	0.1296	0.2014	0.1459	-0.0048	0.1384
120	0.1063	0.0134	0.1500	-0.0350	-0.0807	-0.1744	-0.1256	0.1226
121	0.1206	0.0564	0.1201	-0.0433	-0.0831	-0.0112	0.0159	0.1577
122	0.0575	-0.0741	0.0769	0.0014	0.0312	-0.0831	-0.1094	0.0144
123	0.1084	0.0166	0.1337	-0.0292	-0.0505	-0.1058	-0.0865	0.1128
124	0.1135	0.0282	0.0941	0.0641	0.0614	-0.1061	-0.1332	0.0140

ROW	COL. 97	COL. 98	COL. 99	COL. 100	COL. 101	COL. 102	COL. 103	COL. 104
1	0.0750	0.1353	-0.2070	0.0419	-0.0725	0.0350	0.0399	0.0232
2	0.0452	-0.1692	0.1195	0.0596	0.0471	-0.1022	0.1048	-0.0811
3	-0.0908	0.2692	-0.1162	0.0781	0.1320	0.0237	0.0790	0.1656
4	0.1197	0.1506	0.0190	0.2257	-0.0382	0.1626	0.1259	0.0342
5	0.0249	-0.0680	-0.1291	0.1116	0.1041	0.0098	0.0076	0.0377
6	-0.0377	-0.1412	0.0435	-0.0394	0.1619	0.1642	0.0158	0.1584
7	-0.0087	-0.1361	0.0419	-0.0362	0.1855	0.1112	0.0153	0.1420
8	0.0300	0.0796	-0.0245	-0.0303	0.0642	-0.0115	0.0870	-0.0441
9	-0.0077	0.1244	-0.0093	0.0886	0.0496	0.1321	0.2608	0.0466
10	-0.0078	0.0901	-0.0277	0.0338	0.0557	-0.0130	0.0768	0.0574
11	-0.0080	0.0395	-0.1101	0.0968	0.0324	0.1017	0.0194	0.0957
12	-0.0130	-0.0670	-0.0444	0.0470	0.0864	-0.0866	-0.0331	-0.0590
13	-0.0571	0.1740	-0.0786	0.1529	0.2189	-0.1547	-0.0286	0.0459
14	0.2220	-0.0811	0.2321	0.2095	0.0362	0.1830	0.3703	0.0318
15	0.1302	-0.1567	0.0901	0.1472	0.2567	0.1747	0.2719	0.1341
16	-0.0076	-0.0028	0.0659	0.1360	0.0118	0.0966	0.1425	-0.0486
17	0.0554	0.1032	0.0457	-0.0304	-0.0648	-0.0045	0.0166	-0.0423
18	0.0413	-0.0671	0.0066	0.0349	-0.0175	0.2351	0.0261	-0.0516
19	0.0772	-0.0554	0.0725	0.0252	-0.0384	0.2253	0.0264	-0.0525
20	0.1590	-0.2019	-0.0881	0.0112	0.0647	0.0957	0.0741	0.1474
21	-0.0523	0.0269	-0.0083	-0.0442	-0.1136	-0.0039	-0.0630	-0.0149
22	-0.0527	0.0330	0.0545	0.1675	0.0578	0.2530	0.3144	0.1710
23	-0.1654	0.0565	0.0015	0.0789	-0.0655	0.1032	-0.0325	0.0557
24	-0.0490	-0.2592	-0.0437	-0.0489	0.0396	0.1183	0.1307	0.0665
25	-0.0567	-0.0608	-0.0260	0.2565	0.0036	0.0926	-0.0909	0.1648
26	0.0728	-0.0376	-0.0239	0.1157	0.0503	-0.1282	0.0042	0.1457
27	0.0690	-0.1271	0.0322	0.1716	0.0723	-0.0588	0.1000	0.0592
28	-0.0311	0.0506	-0.0069	0.0514	0.1002	-0.0696	0.0533	0.0647
29	-0.0740	-0.1227	-0.0355	0.1627	0.0156	0.0982	0.0983	0.1285
30	-0.0441	-0.0403	-0.0702	0.1097	-0.0427	0.1015	0.0786	0.1024
31	-0.0498	-0.0220	-0.1299	0.1572	0.0204	0.0647	0.0068	0.0603
32	0.0430	0.2270	0.0407	0.1469	0.2212	-0.0675	0.0326	-0.0096
33	0.0112	-0.1867	-0.0462	-0.1147	-0.1596	0.0585	-0.0198	0.0723
34	-0.2001	-0.0472	0.0125	0.0775	-0.0546	0.0068	0.0053	-0.1614
35	0.1361	-0.0076	0.1980	-0.0869	0.0773	0.0479	0.0196	-0.0037
36	0.3107	0.0325	0.2331	-0.1364	0.1874	0.0628	0.1566	0.0560
37	0.1312	0.0268	-0.0589	0.0278	0.0027	-0.1666	-0.1197	-0.1250
38	0.2614	-0.0239	0.2361	-0.1329	0.1720	0.0002	0.1923	0.0587
39	0.0920	0.0841	-0.1061	0.0517	0.2204	-0.0971	-0.0630	0.0121
40	-0.0895	-0.2515	-0.0295	-0.0757	0.1029	0.0651	0.0504	0.0019
41	-0.0169	0.1531	0.0057	-0.0558	-0.0023	0.0382	-0.0117	0.0103
42	-0.0739	0.1227	0.0506	0.1143	0.1343	-0.0092	0.0060	-0.1354
43	-0.0552	0.1171	0.0713	0.0532	-0.1200	-0.0747	0.0092	-0.0511
44	0.0006	-0.1335	0.0021	0.1191	0.0337	-0.1743	-0.0057	-0.0262
45	0.0678	0.1857	0.0433	0.0078	-0.0182	-0.0584	0.0158	-0.0162
46	-0.0790	0.0181	-0.0473	-0.2283	-0.1908	0.1544	0.0664	0.1966
47	-0.0421	0.0396	-0.1681	0.1293	0.0055	0.1209	-0.0612	-0.1432
48	0.0194	-0.0292	-0.0417	-0.0958	-0.0634	0.0015	-0.0311	0.0454
49	-0.0800	-0.0682	-0.1638	0.0960	0.0436	0.0460	0.0102	0.0633
50	0.0157	0.2400	0.0178	-0.0682	-0.0822	0.0802	0.0732	0.1145
51	-0.1509	-0.0854	-0.1433	-0.0751	0.0504	0.0124	-0.2787	0.0473

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52	-0.0053	-0.0798	-0.1279	0.0853	0.0879	0.0679	-0.0268	0.0884
53	0.1002	-0.0185	-0.0564	-0.0529	-0.0028	0.0222	0.0495	-0.0350
54	-0.0644	0.0229	0.0459	0.0990	-0.1259	0.0103	0.0079	0.0393
55	-0.0286	-0.0661	0.0843	0.0434	-0.0126	-0.1610	-0.0091	-0.1122
56	0.0295	-0.1036	-0.0171	-0.0911	-0.0999	-0.0541	-0.0776	-0.2235
57	0.0477	0.0523	-0.0769	0.0242	0.0342	-0.1435	-0.1942	-0.1381
58	-0.0643	-0.2396	-0.0579	0.0400	0.0170	-0.0676	-0.0961	0.0761
59	0.0663	-0.1854	0.0745	0.0402	-0.0314	0.1026	0.1524	0.0315
60	0.0719	-0.0459	0.0638	0.0137	0.1494	-0.0910	0.0545	0.0372
61	-0.1405	0.0680	-0.0086	0.0011	0.0511	0.0249	0.0642	0.1510
62	-0.0635	-0.1197	0.1072	0.0355	0.0117	0.0836	0.2186	0.1757
63	0.0047	0.0133	-0.0420	-0.1426	-0.0562	0.0935	0.1192	0.0621
64	-0.2022	-0.0712	-0.1441	-0.0344	0.0115	-0.1735	-0.1281	-0.0553
65	-0.0162	0.1068	0.0417	-0.0594	0.0600	-0.1811	-0.0574	-0.1555
66	-0.0477	0.1613	-0.0943	0.1489	0.0445	0.1656	0.1783	0.0646
67	0.2265	0.1742	0.0504	0.0376	0.1099	0.3001	0.2709	0.1295
68	-0.0171	-0.0490	0.1435	0.0746	-0.0593	0.0591	-0.0037	0.0423
69	-0.0321	0.1162	0.0826	0.0495	-0.0058	0.0358	0.0780	-0.0585
70	0.0157	-0.1231	-0.1245	0.0463	-0.1216	-0.0727	-0.0782	-0.1158
71	-0.0622	0.0654	0.0291	-0.0632	-0.0227	0.2103	0.1629	0.0256
72	0.0842	-0.0437	0.0134	0.1345	0.1842	0.0840	0.0651	0.0742
73	0.0327	0.0775	0.0164	0.0107	0.0436	0.1023	0.0792	0.0264
74	0.1030	0.1444	0.1347	-0.0171	-0.2497	0.1416	0.0612	-0.0272
75	-0.0667	0.0666	-0.0847	-0.1253	-0.1277	0.0442	-0.0179	-0.1262
76	0.0965	0.0943	0.0224	-0.1253	-0.1676	0.1316	0.1019	0.0404
77	-0.0038	-0.0624	-0.2473	0.1352	0.2052	0.0119	-0.0191	0.0507
78	0.0444	-0.0511	0.0504	-0.1274	-0.1277	0.0645	0.0184	-0.1424
79	-0.0192	0.0312	0.1279	0.0087	-0.0716	-0.0322	0.0924	0.0135
80	0.1776	0.0318	0.0428	-0.1359	-0.0273	0.1850	0.1113	-0.0207
81	-0.0664	-0.0376	0.0116	0.0616	0.0373	0.0054	0.0042	-0.1583
82	-0.0404	-0.0921	0.0715	0.0525	0.1912	-0.0678	0.0653	-0.1140
83	-0.0434	-0.0418	-0.0140	-0.0747	0.1740	-0.0496	-0.0530	-0.0855
84	0.1433	0.0045	-0.0100	0.1101	-0.0191	0.1365	0.1057	0.0593
85	-0.0277	0.0449	-0.0138	-0.0737	-0.0044	-0.0464	-0.0078	-0.1014
86	-0.0014	-0.0631	0.0104	0.0557	0.1548	-0.0585	0.0202	-0.0216
87	0.1107	0.0020	0.0219	-0.0327	0.0174	0.1582	0.2085	0.1103
88	0.1463	-0.0411	0.0040	-0.0444	0.1472	0.1035	0.2276	0.0551
89	0.2557	0.1504	0.0659	-0.0302	0.1682	0.0451	0.0349	0.1016
90	0.1166	-0.0707	0.0510	0.1048	0.2091	0.0927	0.0156	0.1376
91	0.3043	0.0622	-0.0150	0.0836	0.1651	0.0266	-0.0316	0.0375
92	0.1121	0.3273	0.0017	0.2319	0.3574	0.1729	0.1572	0.2007
93	0.3200	-0.3735	0.0060	0.0561	-0.0120	-0.1087	0.0658	-0.1105
94	0.6352	0.0760	0.3120	-0.0196	0.0879	-0.0110	0.3987	-0.0471
95	0.6159	0.0639	0.2974	-0.1553	-0.0120	-0.0092	0.3778	0.1549
96	0.2965	0.2105	0.0901	0.0672	0.2436	0.1153	0.3716	0.0825
97	1.0000	0.0053	0.3152	-0.0623	0.0312	0.0655	0.3712	0.0921
98	0.0053	1.0000	0.0190	-0.1475	-0.1377	0.1626	0.1259	0.0342
99	0.3152	0.0190	1.0000	-0.1269	-0.1567	0.1155	0.5474	-0.0105
100	-0.0623	-0.1475	-0.1269	1.0000	0.3707	-0.0147	-0.0114	0.0301
101	0.0312	-0.1377	-0.1567	0.3707	1.0000	0.0343	0.0266	0.1314
102	0.0655	0.1626	0.1155	-0.0147	0.0343	1.0000	0.5159	0.5274
103	0.3712	0.1259	0.5474	-0.0114	0.0266	0.5159	1.0000	0.4084
104	0.0921	0.0342	-0.0105	0.0301	0.1314	0.5274	0.4084	1.0000
105	-0.0451	-0.1726	-0.1101	0.0968	0.1317	0.0250	-0.0095	0.1691
106	-0.0357	0.1597	0.0291	0.2744	0.2796	0.0505	0.1531	0.1474
107	0.0597	0.2068	0.2121	-0.0852	0.0600	0.1002	0.3290	0.0743
108	0.2453	0.0746	0.1566	-0.0627	0.1774	0.4115	0.2495	0.2012
109	0.0467	-0.0633	-0.1047	-0.0852	0.2670	0.1697	0.0749	0.1601
110	0.0512	0.1124	-0.0051	0.1603	0.0730	-0.0076	0.1810	0.1027
111	0.2195	-0.0078	0.0540	0.0259	-0.0718	-0.0150	0.0510	0.0972
112	0.0721	-0.0143	0.0202	-0.0126	-0.0840	-0.1756	0.0362	0.0364
113	-0.0138	-0.0152	-0.0108	0.1778	0.1110	-0.0414	0.0805	0.1196
114	-0.0651	0.0265	0.0531	-0.0275	-0.0173	0.0250	-0.0995	-0.1462
115	-0.0876	-0.0849	-0.0988	-0.0509	-0.0221	0.1209	-0.0415	-0.1508
116	0.1440	0.0434	0.0306	-0.1719	-0.1156	-0.0593	0.0416	-0.0438
117	0.0171	0.1014	0.1247	-0.0380	0.0667	-0.0277	0.0280	-0.0906
118	0.1348	0.0283	0.0915	0.0072	0.2083	0.1915	0.2159	-0.0645
119	0.0786	0.0827	0.1237	-0.0207	0.1350	0.0859	0.1309	-0.0155

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      120   -0.1474     -0.0019      0.0348      0.0390      0.0863      0.1974      0.1061      0.1685
      121    0.0236     -0.0096      0.1961     -0.0309      0.0979      0.2251      0.2430      0.1534
      122   -0.0606     -0.1080      0.1737     -0.0334      0.0006      0.0345      0.0592     -0.0787
OC    123   -0.0737     -0.0457      0.1518     -0.0084      0.0703      0.1740      0.1525      0.1039
      124   -0.0601      0.0920     -0.0179      0.0632      0.0208      0.0052      0.0335      0.0407

             COL.        COL.        COL.        COL.        COL.        COL.        COL.        COL.
             105         106         107         108         109         110         111         112
      ROW

        1   -0.1057      0.0672      0.0432     -0.0153     -0.2145      0.1588     -0.0438     -0.0363
        2    0.0976      0.0079      0.0196      0.0483     -0.0967      0.0352     -0.0375      0.0370
        3   -0.0251      0.1639      0.1376      0.0194      0.0789      0.0503     -0.1231     -0.0694
        4   -0.1726      0.1597      0.0519      0.1913     -0.0633      0.1824     -0.1195     -0.0143
        5    0.0045      0.0026      0.0572      0.0823     -0.0883      0.0209     -0.0907      0.0220
        6    0.1244      0.2145      0.1158     -0.0200      0.0059     -0.2235     -0.0665     -0.1784
        7    0.1565      0.2611      0.1145     -0.0093      0.0567     -0.2501     -0.1037     -0.2521
        8   -0.1192      0.1220      0.0530     -0.0022      0.2116     -0.0245     -0.0439     -0.0409
        9   -0.0805      0.1930      0.1729      0.2465      0.0802      0.1358      0.0980      0.1004
       10   -0.1350      0.1301      0.0329     -0.0228      0.2197     -0.0277      0.0114     -0.0541
       11   -0.0067     -0.0106     -0.1521     -0.0244     -0.0562     -0.0285      0.0674     -0.0798
       12   -0.0197      0.1342      0.1757      0.0750     -0.0762     -0.0910     -0.2429      0.1047
       13   -0.0170      0.4204      0.1843      0.0469     -0.0152      0.0466     -0.0576      0.0751
       14   -0.0109      0.1434      0.0411      0.5195      0.1059      0.2007      0.1564      0.0444
       15   -0.0481      0.2419     -0.0099      0.3206      0.2629      0.1526      0.1297      0.1797
       16   -0.0561     -0.0469      0.0532      0.3751      0.0040      0.0195      0.0428      0.0789
       17   -0.1436     -0.0513      0.0240     -0.0181     -0.0837     -0.0650      0.0729      0.0547
       18   -0.1053      0.1709      0.0821      0.7019     -0.1871     -0.0639     -0.2050     -0.1114
       19   -0.0569      0.1452      0.0746      0.1879     -0.2449     -0.0630     -0.1594     -0.0503
       20    0.1071     -0.1158      0.0247      0.1396     -0.0481     -0.0395      0.1159      0.0404
       21   -0.1561      0.1523     -0.0227     -0.0326     -0.1494     -0.0043     -0.0454      0.1409
       22    0.2303      0.1060      0.2220      0.3298      0.1277      0.0548      0.1324     -0.0615
       23   -0.0734     -0.1915     -0.0812      0.1504      0.1029      0.0326     -0.0066     -0.0634
       24    0.0138     -0.0415      0.0028      0.0458     -0.0035     -0.0169      0.0546     -0.0008
       25    0.0289     -0.0296     -0.1002     -0.0907     -0.0908     -0.0260     -0.0112     -0.2014
       26    0.0102     -0.0315      0.0963     -0.0307     -0.0741     -0.0239     -0.0174      0.0230
       27   -0.0230      0.0013     -0.0066     -0.0065     -0.0005      0.0668     -0.0369      0.1282
       28   -0.0161     -0.0759     -0.0023     -0.0034      0.0074      0.0359     -0.1052      0.0377
       29   -0.0539      0.0247      0.0977      0.0132      0.0479     -0.0965      0.0080     -0.0116
       30   -0.1252     -0.0084      0.0497      0.0306      0.0182     -0.0702      0.1157      0.0330
       31   -0.0528      0.0458     -0.0021      0.0096      0.0588     -0.0111      0.1629      0.0146
       32   -0.0764      0.2444      0.1113      0.0783     -0.0675      0.1329     -0.0923     -0.1119
       33    0.1395     -0.1732     -0.0476     -0.0581      0.1327     -0.1326      0.1607      0.0240
       34   -0.1321     -0.1375     -0.1401      0.0571     -0.1256      0.0145     -0.2054      0.1444
       35   -0.2952     -0.0678      0.0120      0.0042     -0.1178     -0.1252     -0.1332     -0.0497
       36   -0.3047      0.0269      0.0153      0.1400     -0.0786      0.0926     -0.0193      0.0785
       37   -0.0127      0.1487     -0.0264     -0.1710     -0.0642      0.1772     -0.0136      0.0176
       38   -0.2872      0.0866      0.0546      0.1256     -0.0340      0.0677      0.0018      0.0451
       39    0.0367      0.1435      0.0059      0.1507      0.0297      0.1028     -0.0719     -0.0377
       40    0.0494      0.1563      0.1281      0.0751      0.0650     -0.3043     -0.0464     -0.0853
       41    0.0584      0.1654      0.0500      0.0259     -0.0027     -0.0887     -0.0849     -0.1019
       42    0.0477      0.1712      0.1537      0.0584      0.0139     -0.0174     -0.0602     -0.1616
       43   -0.0012      0.0601      0.0832      0.0009      0.0557      0.0407     -0.0003     -0.1986
       44    0.0449      0.1007      0.0218     -0.0226      0.0041      0.0198      0.0354      0.2552
       45    0.0003      0.1035      0.0612      0.1253     -0.0901      0.1640      0.0795      0.1066
       46    0.0575     -0.0374      0.0133     -0.0148     -0.1450     -0.0365      0.0836      0.0655
       47    0.0096     -0.1775     -0.1044     -0.0277      0.1404     -0.0264     -0.1927      0.0490
       48    0.1634     -0.2679     -0.0991     -0.1564      0.0461     -0.0707      0.0975     -0.0279
       49   -0.0166     -0.0905      0.1082     -0.0769      0.0703     -0.1438      0.0576      0.1171
       50   -0.0325     -0.0504      0.1042      0.0370      0.0445     -0.0128      0.2458      0.0623
       51    0.1447      0.0098     -0.1341     -0.0178     -0.0178     -0.1453     -0.1653     -0.0554
       52    0.1373      0.0059     -0.2504     -0.0746      0.1478      0.0355      0.2312     -0.1399
       53    0.0902     -0.0601     -0.0464     -0.0805     -0.0127     -0.1005     -0.0461     -0.1491
       54    0.0047     -0.0882     -0.0280     -0.1376     -0.0252     -0.2187      0.0700      0.0834
       55    0.1336      0.0116      0.0361     -0.1029     -0.1106     -0.2356     -0.0309      0.0940
       56   -0.0196     -0.0426      0.0476     -0.1021     -0.1245     -0.0416     -0.1772      0.0283
       57   -0.1647     -0.0311     -0.1410      0.0508      0.0546      0.0752      0.1511     -0.0324
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58	0.2104	0.0746	0.0503	-0.2377	-0.1170	-0.0293	-0.0819	0.0653
59	-0.0228	0.0660	0.0069	-0.0416	-0.0884	-0.1056	-0.2325	-0.0200
60	0.1159	-0.1577	-0.0600	-0.0556	-0.0496	-0.0219	-0.0027	0.0489
61	-0.0019	-0.0147	0.0327	-0.0558	0.0363	-0.0702	0.1215	0.0626
62	0.3278	-0.0410	0.0365	-0.0816	0.0293	-0.0336	-0.0632	0.0167
63	0.0692	-0.0127	0.1105	0.1660	-0.1413	0.0916	0.1324	-0.0670
64	0.1452	-0.0021	0.1058	-0.0579	-0.0266	-0.0255	0.0834	0.0510
65	-0.1387	0.1466	-0.1194	-0.0446	-0.0441	0.0056	-0.0635	0.0437
66	0.0118	0.0644	0.1151	0.1078	-0.1725	-0.0643	-0.1055	-0.1047
67	0.0765	-0.0082	0.1378	0.2280	0.1763	-0.2530	-0.0790	-0.1199
68	0.0272	-0.0863	-0.2446	-0.0646	0.0468	0.0237	-0.1026	-0.1747
69	0.0605	-0.0019	0.0759	-0.0278	0.0170	0.0168	-0.1327	-0.1523
70	-0.0594	-0.0446	0.2077	0.0372	-0.0009	0.0256	0.0798	0.1091
71	-0.1239	-0.1156	-0.1254	0.1173	-0.1176	-0.0119	0.0049	-0.0873
72	-0.1222	0.1130	0.0368	0.1118	0.1897	0.2612	-0.1573	0.0834
73	-0.0182	0.0124	0.1364	0.0643	0.1689	0.2175	-0.1055	0.0363
74	-0.1437	-0.0102	0.0649	-0.0746	-0.1366	-0.0650	-0.1063	-0.0472
75	-0.0415	-0.0116	-0.0689	-0.0906	0.0046	0.1296	0.0738	0.0460
76	-0.1204	-0.0116	0.1786	0.0281	0.0940	0.0868	-0.1411	0.0235
77	-0.1545	0.0419	0.1403	0.1553	0.2276	0.1032	-0.0477	0.0163
78	0.0203	-0.0082	0.0588	0.0432	-0.0347	0.0937	-0.0703	0.0165
79	0.2083	-0.1173	0.0812	-0.0978	0.0768	0.0788	-0.0055	-0.0410
80	0.0377	0.1142	0.1569	0.1904	0.0629	0.0428	-0.1254	-0.1205
81	-0.1051	-0.0266	-0.1496	0.0454	0.0842	0.3100	-0.2767	0.1164
82	-0.1945	0.0301	0.1463	0.0112	0.0490	-0.1492	-0.2724	0.1765
83	-0.1768	0.0906	0.2667	-0.0550	0.1711	-0.4157	-0.3054	0.1117
84	-0.1042	0.1965	0.1291	0.1293	0.0068	-0.2673	-0.2011	0.1426
85	-0.1500	0.0653	0.2330	0.0670	-0.0116	-0.1412	-0.1917	-0.1126
86	-0.0657	0.1018	0.2741	0.0250	-0.0962	-0.1243	-0.1885	-0.0079
87	0.0813	0.1355	0.2750	0.1424	0.0531	-0.0960	-0.1757	-0.0760
88	-0.1207	0.0472	0.1291	0.1856	0.0720	-0.1689	-0.1552	0.0449
89	-0.1330	0.0278	0.0030	0.1736	0.2603	0.1670	0.1356	0.0253
90	-0.1059	0.1556	-0.0604	0.0950	0.2260	0.1473	0.0760	-0.1305
91	-0.0961	0.1191	0.0243	0.0680	0.2619	0.1241	0.0159	-0.0157
92	-0.0155	0.4014	0.1386	0.2418	0.0756	0.2212	0.0593	-0.0289
93	-0.0271	-0.0995	0.2425	0.0737	0.1600	0.0860	0.1814	0.1445
94	-0.0651	0.0121	0.1395	0.0678	0.1332	0.0844	0.0249	-0.0844
95	-0.0271	0.0321	0.1388	0.0727	0.1047	0.0860	0.0370	-0.0649
96	-0.2152	0.3232	0.2463	0.2433	0.0822	0.1676	-0.0270	-0.1656
97	-0.0651	-0.0357	0.0597	0.2053	0.0467	0.0512	0.2156	0.0721
98	-0.1726	0.1497	0.2006	0.0746	-0.0623	0.1826	-0.0676	-0.0143
99	-0.1101	0.0291	0.2131	0.1566	-0.1047	-0.0056	0.0540	0.0202
100	0.0968	0.2744	-0.0852	0.0827	-0.0852	0.1603	0.0759	-0.0126
101	0.1217	0.2798	0.0600	0.1774	0.2670	0.0730	-0.0730	-0.0840
102	0.0250	0.0505	0.1002	0.4115	0.1697	-0.0029	-0.0156	-0.1765
103	-0.0685	0.1531	0.3280	0.4495	0.0744	0.1810	0.0510	0.0362
104	0.1491	0.1934	0.0743	0.2912	0.1608	0.1027	0.0972	0.0264
105	1.0000	0.0402	-0.0778	-0.1409	0.0665	-0.1101	0.1790	-0.0812
106	0.0432	1.0000	0.2649	0.1423	-0.0101	0.1074	-0.0613	-0.0023
107	-0.0778	0.2649	1.0000	0.2645	0.1381	-0.1305	-0.0874	0.0553
108	-0.1409	0.1423	0.2645	1.0000	0.1430	0.1566	0.0565	0.0512
109	0.0445	-0.0101	0.1381	0.1430	1.0000	-0.0271	0.1172	0.0693
110	-0.1101	0.1074	-0.1305	0.1566	-0.0271	1.0000	0.2258	0.0993
111	0.1790	-0.0012	-0.0674	0.0565	0.1172	0.2258	1.0000	0.3269
112	-0.0812	-0.0023	0.0555	0.0512	0.0693	0.0993	0.3269	1.0000
113	-0.1527	0.2700	0.2520	0.1507	-0.0022	-0.0880	-0.1645	-0.1045
114	-0.0067	-0.1630	-0.1521	-0.1992	-0.0059	-0.0288	-0.1556	-0.0515
115	0.4110	-0.1641	-0.1562	-0.0757	0.0675	0.0261	0.3137	0.0274
116	-0.1266	-0.0160	-0.0164	0.1210	-0.0618	0.1411	0.1654	0.2406
117	0.0029	0.0474	0.0509	0.0192	0.0812	-0.0503	-0.0903	-0.1463
118	-0.0007	0.0469	0.1625	0.4049	0.2059	0.1658	0.1196	0.0570
119	0.0034	0.0621	0.1414	0.2265	0.1425	0.0550	0.0123	-0.0699
120	0.0098	0.1394	-0.0217	-0.0236	0.0753	-0.0186	0.0223	-0.0125
121	-0.0544	0.0438	0.1497	0.1142	0.1372	0.0077	0.0017	0.0031
122	-0.0227	0.1100	-0.0229	-0.0303	-0.0078	-0.0716	0.0202	0.0302
123	-0.0245	0.1321	0.0369	0.0204	0.0770	-0.0321	0.0173	0.0076
124	-0.1754	0.1468	0.1040	0.1260	-0.0775	0.1268	-0.0029	-0.0819

ROW	COL. 113	COL. 114	COL. 115	COL. 116	COL. 117	COL. 118	COL. 119	COL. 120
1	-0.0627	-0.0771	-0.0969	0.2795	-0.0093	0.0671	0.0336	0.0105
2	0.1425	-0.1563	-0.1158	0.1100	0.0902	0.1010	0.1219	0.0765
3	0.1950	-0.0251	-0.0596	-0.1920	0.1497	0.0603	0.1178	-0.0023
4	0.1456	-0.1726	-0.0849	0.0434	0.1014	0.0525	0.1052	0.0653
5	-0.0536	0.0045	-0.0936	0.1532	0.0283	0.0268	0.0490	0.0255
6	0.1621	-0.2216	0.0709	0.0054	0.1262	0.0228	0.0579	0.1121
7	0.1818	-0.2226	0.1029	-0.0497	0.1817	0.0596	0.1260	0.1397
8	-0.1266	0.0517	0.1095	0.0134	0.0891	0.0723	0.1070	0.0884
9	-0.2510	0.1479	0.0054	0.2080	-0.0431	0.2550	0.1141	0.1547
10	-0.1244	0.0158	0.1240	0.0414	0.0481	0.0467	0.0654	0.0132
11	-0.2026	0.0443	0.2678	-0.0650	0.1887	0.1694	0.2033	[illegible]
12	0.0046	-0.0147	-0.1968	0.1530	0.1954	0.0261	0.1758	[illegible]
13	0.0049	-0.0170	-0.1461	0.1392	0.3611	0.1397	0.2946	0.1911
14	0.0711	-0.1321	-0.1802	0.2377	0.0472	0.2917	0.2103	0.0622
15	0.0797	-0.1901	-0.0769	0.2112	-0.0076	0.1699	0.0917	0.1705
16	0.0073	0.0042	-0.0870	0.0607	-0.0267	0.1072	0.0428	-0.0286
17	-0.0081	-0.1635	-0.0668	0.2935	0.1864	0.1408	0.1954	-0.0460
18	-0.0594	-0.0132	0.0757	-0.0345	-0.0863	-0.0078	-0.0616	0.0888
19	-0.0479	0.0010	0.0798	-0.0249	-0.0965	-0.0640	-0.0663	0.1055
20	0.0753	-0.0271	0.1644	-0.0902	-0.1430	0.1498	-0.0130	0.1756
21	0.0443	-0.1561	0.0371	0.0437	-0.0267	-0.0545	-0.0473	-0.0113
22	0.0757	-0.1283	-0.0028	0.0677	-0.0016	0.2625	0.1529	-0.0152
23	-0.0435	0.0475	0.0090	0.0471	0.2520	0.1867	0.2708	0.0545
24	-0.0723	-0.0733	-0.0313	0.2301	-0.0068	0.0359	0.0129	0.0273
25	-0.0789	0.0082	0.1955	-0.1436	0.3542	0.1805	0.3150	0.4772
26	-0.0723	0.0102	0.1747	-0.0920	0.2612	0.1231	0.2404	0.2658
27	-0.1001	0.1743	-0.0580	0.0177	0.2070	0.1937	0.2375	0.0360
28	-0.0406	0.0216	0.0769	0.0045	0.2112	0.2137	0.2562	0.1853
29	0.0688	0.0452	-0.0243	-0.1346	0.1398	0.1003	0.1432	0.1426
30	0.0268	0.1817	-0.1123	-0.0785	0.2121	0.1416	0.2076	[illegible]
31	0.0435	0.0619	0.0651	-0.1507	0.1007	0.1313	0.1317	0.2527
32	0.1623	-0.0709	-0.0605	0.0282	0.3620	0.0607	0.2679	0.1151
33	-0.0546	0.0274	0.1207	-0.0569	-0.2226	0.0152	-0.1216	0.0609
34	-0.0372	0.1284	-0.0650	-0.0765	-0.2967	-0.2737	-0.2400	-0.1574
35	-0.1752	0.0121	-0.2670	0.3616	0.1149	0.0909	0.1715	-0.1616
36	-0.0815	-0.0437	-0.2552	0.4536	0.0550	0.1461	0.1150	-0.1426
37	-0.0526	0.1379	-0.0302	-0.0418	0.2435	0.1427	0.2177	-0.0273
38	-0.0761	-0.1422	-0.2357	0.4392	0.0927	0.1389	0.1289	-0.0467
39	-0.0724	-0.0826	0.2427	0.1774	0.2565	0.1974	0.2603	0.1776
40	0.1120	0.0399	0.0332	-0.3004	0.1038	0.0081	0.0067	0.0303
41	0.0153	0.0284	0.0170	-0.1129	0.6794	0.3161	0.5847	0.3319
42	0.1036	-0.0294	0.0777	-0.1769	0.5977	0.4352	0.5749	0.3043
43	0.0135	0.0486	0.1001	-0.2007	0.5284	0.2049	0.4280	0.3153
44	0.0147	-0.1465	0.0172	0.2073	0.2675	0.1867	0.3627	0.1436
45	0.0061	-0.2635	-0.0659	0.3230	0.3516	0.3001	0.3857	0.1822
46	-0.0791	-0.0102	0.0871	-0.0672	-0.1497	-0.2092	-0.1165	-0.1203
47	-0.0764	0.1434	-0.0729	-0.1411	0.1547	0.0308	0.1043	-0.0148
48	-0.1747	0.0465	0.1327	0.0046	0.0769	0.0482	0.0866	-0.0558
49	-0.0673	-0.1976	0.1694	0.1781	-0.0459	0.0500	-0.0107	-0.1305
50	0.0327	-0.1415	0.1179	0.0405	0.2919	0.1170	0.2642	0.0641
51	0.0686	-0.0188	0.1071	-0.1374	-0.0170	0.0058	-0.0037	0.0165
52	-0.1175	0.0454	0.3014	-0.1629	0.1122	-0.0062	0.0549	0.1446
53	0.0665	-0.0250	0.0232	-0.0405	-0.1522	-0.1358	-0.1381	-0.1245
54	-0.0654	-0.1046	0.1414	0.1384	-0.0419	0.0261	-0.0184	0.1484
55	-0.0411	0.0471	0.1263	-0.1144	-0.0031	0.0427	0.0185	0.0044
56	-0.1215	0.3361	-0.1426	-0.1465	-0.1470	-0.1172	-0.1547	-0.0338
57	-0.0600	0.0727	-0.1094	0.1381	0.1459	0.1482	0.1250	0.0276
58	0.0515	-0.0497	0.1304	-0.1221	-0.3352	-0.3023	-0.3679	-0.1454
59	0.0378	-0.0275	0.0961	-0.1081	-0.2427	-0.2654	-0.3061	0.0376
60	-0.0141	0.0645	0.1407	-0.1103	-0.2276	-0.2391	-0.2582	-0.0454
61	0.0031	0.0782	0.0078	-0.1170	-0.2144	-0.2613	-0.2607	0.0617
62	-0.0943	0.1451	0.1850	-0.2749	0.0652	-0.2205	-0.1170	0.1160
63	0.1831	-0.3248	0.1617	0.0348	-0.0848	0.1347	0.0238	0.0573

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 64     0.0713   -0.2396    0.1729    0.0693    0.0656    0.0819    0.0869    0.0611
 65    -0.0280    0.0275   -0.0592    0.0552    0.0598   -0.1987   -0.0512   -0.0987
 66    -0.0252    0.0259    0.1249   -0.1228   -0.0535   -0.0044   -0.0408   -0.0041
 67     0.1441   -0.1264    0.0761   -0.1132    0.0278    0.0685    0.0402   -0.0536
 68    -0.1129    0.0433    0.0177    0.0247    0.0749   -0.1226   -0.0081   [illegible]
 69     0.0310   -0.0848    0.0881   -0.0886    0.1360    0.1098    0.2677   [illegible]
 70     0.0384   -0.0790    0.0636   -0.0043   -0.2833   -0.0076   -0.1274   [illegible]
 71   [illegible] -0.0777   -0.1241    0.1520    0.0225    0.2270    0.1194    0.0273
 72    -0.1321    0.1264   -0.0601   -0.0706    0.0425    0.1737    0.1517    0.2006
 73    -0.1249    0.1123    0.1246   -0.0967    0.0243    0.2412    0.1247    0.1805
 74     0.2176   -0.0141   -0.1227   -0.1835   -0.0935    0.0470   -0.0953   [illegible]
 75    -0.0769    0.1300    0.0047   -0.0554   -0.0801   -0.2640   -0.1733    0.0366
 76    -0.0179    0.0486    0.0275   -0.0617   -0.0267    0.2274    0.0437    0.1126
 77     0.0229   -0.2052    0.1574    0.1057    0.0753    0.2529    0.1749   -0.0847
 78    -0.1447    0.1247    0.0761    0.0009   -0.0325    0.0619    0.0064   [illegible]
 79    -0.0449    0.1764    0.0136   -0.1564    0.0039    0.2349    0.1730    0.1273
 80    -0.0276    0.0177    0.0494   -0.0715    0.0467    0.1777    0.1241   [illegible]
 81    -0.1314    0.2177   -0.0517   -0.0609    0.0114    0.1494    0.0594   [illegible]
 82     0.0143    0.1205   -0.1554   -0.0451    0.1306    0.1432    0.1211    0.2027
 83     0.1141    0.0379   -0.2649   -0.0437    0.1429    0.0764    0.2717    0.1915
 84     0.0744    0.0350   -0.1472   -0.0226    0.1299    0.1656    0.2109    0.1366
 85     0.1571   -0.1224   -0.1069    0.0355   -0.0272   -0.0219   -0.0489   [illegible]
 86     0.1710   -0.1522   -0.0590    0.0238    0.0555    0.1117    0.0675   -0.0163
 87     0.2066   -0.1064    0.0191   -0.0416    0.1341    0.2081    0.1864    0.0626
 88   [illegible] -0.2046   -0.1651    0.0547    0.1111    0.2019    0.1478    0.0629
 89   [illegible]  0.0515    0.0657   -0.0058    0.0964    0.1767    0.1702    0.1043
 90    -0.0407    0.0585   -0.0827    0.0522   -0.1531    0.0437   -0.0745    0.0134
 91    -0.1188    0.0492   -0.1106    0.2624    0.1608    0.2132    0.1946    0.1605
 92     0.1240   -0.1164   -0.1166    0.0461    0.0474    0.2002    0.1704   -0.0560
 93    -0.1012   -0.0457    0.0479    0.1963    0.1116    0.2609    0.2014   -0.0407
 94    -0.0788   -0.0776   -0.0065    0.1232    0.1240    0.1269    0.1454   -0.1744
 95     0.0897   -0.1643    0.0974    0.1036    0.0047   -0.0364   -0.0041   -0.1756
 96     0.0332   -0.0140   -0.1719    0.1526    0.1064    0.1448    0.1374   [illegible]
 97    -0.0138   -0.0451   -0.0476    0.1940    0.0171    0.1346    0.0786   -0.1474
 98    -0.0152    0.0195   -0.0849    0.0434    0.1014    0.0343    0.0477   -0.0014
 99    -0.0178    0.0631   -0.0488    0.0768    0.1267    0.0618    0.1337    0.0346
100     0.1774   -0.0775   -0.0534   -0.1719   -0.0380    0.0077   -0.0207    0.0440
101     0.1110   -0.0173   -0.1221   -0.1155    0.0662    0.2093    0.1350    0.0467
102    -0.0314    0.0254    0.1298   -0.0947   -0.0237    0.1915    0.0858    0.1574
103     0.0865   -0.0098   -0.0415    0.0916    0.0240    0.2169    0.1109    0.1041
104     0.1156   -0.1982    0.1495   -0.0439   -0.0006    0.0445   -0.0148    0.1444
105    -0.1177   -0.0062    0.4110   -0.1366    0.0029   -0.0003    0.0034    0.0042
106     0.2700   -0.1430   -0.1691   -0.0160    0.0674    0.0469    0.0671    0.1404
107     0.2726   -0.1521   -0.3562   -0.0144    0.0509    0.1036    0.1414   -0.0317
108     0.1507   -0.1442   -0.0757    0.1210    0.0182    0.4069    0.2265   -0.0336
109    -0.0027   -0.0074    0.0925   -0.0618    0.0813    0.2059    0.1475    0.0745
110    -0.0980   -0.0355    0.0261    0.1411   -0.0403    0.1659    0.0550   -0.0176
111    -0.1648   -0.1552    0.3137    0.1594   -0.0503    0.1198    0.0123    0.0223
112    -0.1655   -0.0613    0.0274    0.2406   -0.1467    0.0570   -0.0299   -0.0128
113     1.0000   -0.1030   -0.2971   -0.3499   -0.0732   -0.0451   -0.0768   -0.1263
114    -0.1030    1.0000   -0.2375   -0.2748    0.0545   -0.0646   -0.0187    0.1347
115    -0.2971   -0.2375    1.0000   -0.1377    0.0037    0.0427    0.0293    0.1415
116    -0.3499   -0.2748   -0.1377    1.0000    0.0276    0.1667    0.1151   -0.1370
117    -0.0732    0.0545    0.0037    0.0276    1.0000    0.5572    0.4006    0.4163
118    -0.0451   -0.0646    0.0427    0.1667    0.5572    1.0000    0.4530    0.2997
119    -0.0768   -0.0187    0.0293    0.1151    0.4006    0.4530    1.0000    0.4653
120    -0.1263    0.1347    0.1415   -0.1370    0.4163    0.2997    0.4653    1.0000
121    -0.1161    0.0326    0.1178   -0.0064    0.2239    0.2990    0.2973    0.6483
122    -0.0931   -0.0082    0.0042    0.0833    0.3750    0.3706    0.4005    0.6818
123    -0.1131    0.0699    0.1012   -0.0223    0.3598    0.3554    0.4239    0.8066
124    -0.0330   -0.0176   -0.0148    0.0441    0.3563    0.3041    0.4025    0.3162

          COL.      COL.      COL.      COL.
          121       122       123       124
  1    -0.0235   -0.0201   -0.0119   -0.0016
  2    -0.0383    0.2260    0.0434    0.1505
  3     0.0047   -0.0927   -0.0350    0.1974
  4     0.1434   -0.0355    0.0766    0.0995
```

```
OC.
 5    0.0709    -0.0232     0.0283     0.0948
 6    0.1764     0.1412     0.1631     0.1146
 7    0.1971     0.1262     0.1705     0.1248
 8    0.2661     0.0622     0.1566    -0.0704
 9    0.2669     0.0810     0.2020     0.1026
10    0.1516     0.0096     0.0748    -0.0410
11    0.1749     0.0135     0.1976     0.1569
12    0.0670     0.1260     0.1064     0.1932
13    0.1558     0.2763     0.1134     0.1681
14    0.0994     0.1170     0.1056     0.1022
15    0.2331     0.1731     0.2143    -0.0449
16    0.0702    -0.0216     0.0047    -0.0326
17    0.0126     0.1648     0.0671     0.0047
18    0.1762     0.2269     0.1484     0.1271
19    0.1714     0.2260     0.1908     0.1159
20    0.1353    -0.0316     0.0894     0.0612
21   [illegible] -0.0374  -0.0354    -0.0500
22    0.1547    -0.0174     0.0438    -0.0136
23   -0.0252     0.0606     0.0233     0.1565
24    0.0796   [illegible]  0.0644    -0.0040
25    0.2444     0.1462     0.0293     0.2661
26    0.1544     0.0155     0.1433     0.2332
27    0.1134    -0.0155     0.0449     0.1767
28    0.0739    -0.0240     0.0453     0.2318
29    0.2438     0.1530     0.2021     0.1864
30    0.1277     0.0736     0.1644     0.1446
31    0.1067     0.0241     0.1470     0.1299
32    0.1361     0.0774     0.1366     0.1777
33   -0.0172     0.0516     0.0430    -0.1235
34   -0.0581    -0.1639    -0.1470    -0.0550
35    0.0140     0.0006    -0.0287     0.0745
36    0.0817     0.0687    -0.0090     0.0447
37   -0.1255     0.2316    -0.0796     0.1363
38    0.1031     0.1475     0.0930     0.0843
39   -0.0033     0.0413     0.0695     0.0914
40   -0.0065     0.0953     0.0627     0.0712
41    0.1498     0.1516     0.2452     0.0987
42    0.1587     0.2422     0.2026     0.0650
43    0.1629     0.1725     0.2217     0.1755
44    0.0204     0.2186     0.1922     0.0566
45    0.1565     0.1691     0.1665     0.0551
46   -0.1417    -0.1617    -0.1642     0.0019
47   -0.0659     0.0701    -0.0026    -0.1003
48   -0.0565    -0.1041    -0.0749     0.0170
49   -0.1314    -0.1330    -0.1547    -0.0763
50    0.0466    -0.0729     0.0264     0.1197
51   -0.1244     0.0461    -0.0152    -0.0106
52   [illegible]  0.1032    0.1564     0.0634
53   -0.1032    -0.0506    -0.1250    -0.1359
54    0.1836     0.1272     0.1567    -0.0041
55    0.0118     0.0176     0.0134    -0.2143
56   -0.0051    -0.0114    -0.0214    -0.0476
57    0.0047     0.0470     0.0372     0.0332
58   -0.0276    -0.1579    -0.1522    -0.1068
59   -0.0212    -0.1425    -0.0573    -0.1208
60   -0.0616    -0.1924    -0.1147     0.0049
61   -0.0176    -0.0697    -0.0085     0.0055
62   -0.0087    -0.0502     0.0240    -0.0177
63    0.1017     0.0766     0.0709     0.0464
64   -0.0276     0.1203     0.0424     0.1109
65   -0.1315     0.0132    -0.0773    -0.0361
66    0.0549    -0.0142     0.0109     0.1009
67   -0.0177    -0.0634    -0.0756    -0.0831
68    0.1152    -0.0037     0.0490    -0.1236
69   -0.0128     0.0788     0.0745    -0.1011
70   -0.0198    -0.0633    -0.0544    -0.0267
71    0.0263     0.0561     0.0398    -0.0343
72    0.1659     0.0720     0.1694     0.0659
```

OC

```
 73   0.1763   0.0889   0.1584   0.0571
 74   0.1320   0.1729   0.1348  -0.1163
 75  -0.0329   0.0163   0.0090   0.0925
 76   0.1754   0.1066   0.1474   0.0672
 77  -0.0333  -0.1721  -0.1124   0.1088
 78   0.0679  -0.0569   0.0144   0.0286
 79   0.0698   0.0434   0.1214  -0.0312
 80   0.1660   0.1221   0.1622   0.0927
 81   0.0596   0.1106   0.0940   0.0148
 82   0.1236   0.1551   0.2057  -0.1002
 83   0.0497   0.2055   0.1736  -0.0999
 84   0.1279   0.2640   0.2079   0.0889
 85  -0.0735  -0.1541  -0.0991  -0.0619
 86  -0.0431   0.0621   0.0016   0.1581
 87   0.0470   0.1221   0.1086   0.0098
 88   0.0514   0.0251   0.0566   0.0262
 89   0.1706   0.0576   0.1084   0.1135
 90   0.0846  -0.0241   0.0166   0.0282
 91   0.1701   0.0759   0.1332   0.0941
 92  -0.0433   0.0014  -0.0292   0.0641
 93  -0.0821   0.0312  -0.0806   0.0614
 94  -0.0112  -0.0831  -0.1058  -0.1051
 95   0.0156  -0.1044  -0.0565  -0.1332
 96   0.1177   0.0179   0.1129   0.0160
 97   0.0336  -0.0606  -0.0737  -0.0601
 98  -0.0096  -0.1060  -0.0457   0.0856
 99   0.1061   0.1717   0.1518  -0.0179
100  -0.0369  -0.0534  -0.0084   0.0632
101   0.0974   0.0227   0.0703   0.0204
102   0.2251   0.0345   0.1740   0.0052
103   0.2470   0.0592   0.1535   0.0335
104   0.1834  -0.0757   0.1039   0.0407
105  -0.0966  -0.0227  -0.0045  -0.1754
106   0.0936   0.1106   0.1321   0.1465
107   0.1497  -0.0229   0.0369   0.1040
108   0.1142  -0.0903   0.0204   0.1260
109   0.1372  -0.0676   0.0770  -0.0775
110   0.0077  -0.0716  -0.0321   0.1268
111   0.0017   0.0182   0.0173  -0.0029
112   0.0031   0.0302   0.0076  -0.0819
113  -0.1161  -0.0551  -0.1131  -0.0330
114   0.0526  -0.0082   0.0699  -0.0176
115   0.1178   0.0042   0.1012  -0.0149
116  -0.0694   0.0533  -0.0221   0.0841
117   0.2226   0.3759   0.3998   0.3563
118   0.2960   0.3306   0.3554   0.3041
119   0.2473   0.4005   0.4239   0.4025
120   0.6552   0.6118   0.8669   0.2162
121   1.0000   0.5761   0.8466   0.1960
122   0.5761   1.0000   0.6659   0.3408
123   0.8466   0.6659   1.0000   0.3292
124   0.1960   0.3408   0.3292   1.0000
```

APPENDIX H

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES

Variable	Mean	S.D.
1	26.23	4.37
2	1.70	0.45
3	1.30	0.46
4	1.05	0.23
5	0.06	0.25
6	0.24	0.43
7	0.43	0.79
8	0.90	0.29
9	1.87	1.06
10	0.88	0.32
11	0.32	0.47
12	4.02	0.82
13	4.37	0.61
14	3.19	1.22
15	2.94	1.23
16	3.20	0.82
17	4.82	1.39
18	1.54	0.54

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES (Continued)

Variable	Mean	S.D.
19	1.53	0.56
20	2.09	0.79
21	0.98	0.10
22	0.33	0.47
23	3.52	1.23
24	2.68	1.43
25	3.09	1.20
26	3.16	1.08
27	2.96	1.11
28	2.98	1.04
29	2.41	1.25
30	2.39	1.21
31	2.31	1.29
32	0.22	0.41
33	0.73	0.44
34	0.03	0.18
35	15.03	1.76
36	3.27	1.54
37	1.56	0.18
38	3.00	1.37

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES (Continued)

Variable	Mean	S.D.
39	3.86	0.46
40	1.75	0.25
41	1.71	0.20
42	1.54	0.22
43	1.58	0.25
44	1.45	0.21
45	1.30	0.18
46	1.77	0.36
47	1.06	0.10
48	1.11	0.26
49	1.18	0.22
50	1.25	0.25
51	1.02	0.06
52	1.06	0.14
53	1.45	0.26
54	1.04	0.15
55	1.05	0.14
56	1.06	0.15
57	1.89	0.10
58	1.14	0.13
59	1.10	0.10

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES (Continued)

Variable	Mean	S.D.
60	1.07	0.08
61	1.04	0.06
62	1.15	0.10
63	38.82	10.76
64	4.13	2.59
65	4.23	1.35
66	0.73	1.03
67	0.58	0.88
68	1.84	1.13
69	1.25	1.17
70	1.43	1.27
71	0.38	0.75
72	0.08	0.46
73	0.08	0.38
74	1.52	1.15
75	1.31	1.07
76	0.17	0.59
77	2.32	0.98
78	0.58	0.88
79	0.30	0.78
80	0.48	0.87

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES (Continued)

Variable	Mean	S.D.
81	0.05	0.38
82	4.66	0.71
83	4.89	0.57
84	4.38	0.89
85	2.83	0.90
86	3.61	0.85
87	3.27	0.97
88	3.54	0.88
89	0.67	0.54
90	0.34	0.52
91	0.39	0.53
92	0.51	0.52
93	0.90	0.36
94	0.89	0.34
95	0.90	0.36
96	0.58	0.49
97	0.79	0.43
98	0.05	0.23
99	0.97	0.30
100	0.83	0.40
101	0.47	0.50

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES (Continued)

Variable	Mean	S.D.
102	0.98	0.32
103	0.98	0.41
104	0.95	0.33
105	0.32	0.47
106	0.68	0.49
107	0.93	0.33
108	0.87	0.42
109	0.32	0.49
110	0.97	0.30
111	0.81	0.44
112	0.62	0.48
113	0.43	0.49
114	0.32	0.47
115	0.10	0.30
116	0.13	0.34
117	19.41	2.41
118	17.96	2.07
119	37.30	3.92
120	20.62	3.59

MEANS AMD STANDARD DEVIATIONS FOR ALL VARIABLES (Continued)

Variable	Mean	S.D.
121	20.32	3.26
122	20.29	3.45
123	61.24	8.99
124	52.95	6.64

APPENDIX I

FREQUENCY OF OPEN-ENDED COMMENTS RECEIVED FROM SAMPLE TEACHERS

FREQUENCY OF OPEN-ENDED COMMENTS RECEIVED FROM SAMPLE TEACHERS

	Field Experience		On-Campus Experiences		
Year of Graduation	Satisfactory	More Needed	More Work in Discipline	Other (Combined)	Miscellaneous
1969-70	5	3	1	10	8
1970-71	13	5	7	12	7
1971-72	13	6	6	11	10
1972-73	20	1	7	15	7
1973-74	20	0	7	10	6